

# A Temporal Importance-Performance Analysis of Recreation Attributes on National Forests

A Technical Document Supporting the Forest Service  
Update of the 2010 RPA Assessment

Ashley E. Askew, J.M. Bowker, Donald B.K. English, Stanley J. Zarnoch, and Gary T. Green



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### ABSTRACT

The outdoor recreation component of the 2010 Resources Planning Act (RPA) Assessment provided projections and modeling of participation and intensity by activity. Results provided insight into the future of multiple outdoor recreation activities through projections of participation rates, numbers of participants, days per participant, and total activity days. These projections can be considered in managing potential shifts in outdoor recreation. In anticipation of projected trends, resources can be allocated appropriately by each outdoor recreation activity, or by the settings in which these activities take place. Decades of marketing and consumer research have established that an industry depends on and benefits from satisfied customers. In this study, we apply a widely used tool with origins in marketing research known as importance-performance analysis (IPA) to better understand visitor satisfaction with recreation settings on national forests. The results from IPA can supplement planning for improving efficient provision of recreation opportunities through management of setting attributes, which in turn could reinforce activity popularity and intensity. With the systematic and consistent data collection methodology in place from the National Visitor Use Monitoring Program, we assessed visitor ratings of importance and satisfaction on multiple attributes related to national forest recreation, as well as overall satisfaction and crowding ratings, over two recent survey periods (rounds 2 and 3) spanning 10 years. These attributes ranged from those in the natural domain (e.g., condition of natural environment and quality of scenery) to the developed setting (e.g., availability of parking and condition of parking lots). We classified the attributes into one of four IPA management actions and also conducted an intertemporal analysis to assess sustainability. The significance of changes in importance and satisfaction between rounds can provide insight into potentially problematic shifts, such as declining satisfaction in conjunction with increasing importance. Overall, users of the national forests were satisfied and found the attributes important. We identify relative overperformers and underperformers to better inform the allocation of resources within site type per attribute for the RPA regions and the Nation.

**Keywords:** Importance-performance analysis, National Visitor Use Monitoring (NVUM) Program, outdoor recreation, recreation setting attributes, Resources Planning Act (RPA) Assessment, visitor satisfaction.



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## KEY FINDINGS

- Recreationists in all four RPA regions and across the Nation generally had high satisfaction levels with their national forest visits.
- Recreationists have the highest overall satisfaction scores on condition of the natural environment, quality of scenery, and perception of safety, all deemed very important to the outdoor recreation experience.
- Visitors to designated Wilderness were generally satisfied, with a possible need for attention to trail conditions in the South.
- For all RPA regions and the Nation, developed sites could benefit from improvement of restroom cleanliness and adequacy of signage.
- Overall, visitor satisfaction increased between two visitor survey rounds conducted over 10 years, most notably by visitors to North Wilderness and South overnight-use developed sites.
- Visitors to the Pacific Coast region perceived increases in crowding, especially in Wilderness. Visitors in the South perceived either declining or static levels of crowding.

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### INTRODUCTION

The Forest Service, U.S. Department of Agriculture, has conducted natural resource analyses for more than a century. The 1974 Forest and Rangeland Renewable Resources Planning Act (RPA) (P.L. 93378, 88 Stat 475, as amended) established a periodic reporting requirement and broadened coverage of the Forest Service analyses to include all renewable resources on forests and rangelands of the United States. The 155 national forests and 20 grasslands in the United States encompass 192 million acres across 43 States, Puerto Rico, and the Virgin Islands, with uses ranging from commercial and economic pursuits to outdoor recreation. The RPA Assessment provides reliable information every 10 years, with 5-year Updates, on the status, trends, and projected future of the Nation's renewable resources. The 2010 RPA Assessment was the fifth assessment prepared under the mandate of the 1974 RPA legislation.

The outdoor recreation component of the 2010 RPA Assessment presented trends and futures (Cordell 2012) and included national projections, through 2060, of participation and use for 17 natural resource-based recreation activities across alternative futures, allowing variation in population growth, socioeconomic conditions, land use changes, and climate (Bowker and others 2012). The 2010 Assessment also provided detailed information about trends in and the current supply of recreation opportunities (Cordell and others 2013). Previous analyses on a decadal basis with similar directives included summaries of demand and recreation supply trends (Cordell and others 1999) and national projections for outdoor recreation to 2040 (Cordell and others 1990), 2050 (Bowker and others 1999), and 2060 (Bowker and Askew 2012, Bowker and others 2012). The methodology for formulating national-level outlooks has also been applied on a regional basis for the South in Bowker and others (2013, 2014) and for the North in Bowker and Askew (2013). The intent with all of these studies was to provide solid evidence of recreation

trends and potential futures with outlooks toward long-term supply and demand.

The recreation experience is a product of complex interactions of human planning and psychology. Recreation planning and management should factor in users' perceptions, improving what could be deterrents and maintaining the attractive features (O'Leary and Adams 1982). Quantifying the psychological and experiential aspects can present challenges, but approximations are available through survey data. This Update to the 2010 RPA supplement evaluates recreation from a different perspective than used in the 2010 RPA Assessment, shifting from respondents' participation indicators and days of activity to levels of satisfaction. Specifically, this study reports on importance-performance analyses (IPAs), also called importance-satisfaction analyses, applied to attributes of the recreation experience on national forests (NFs) across the four RPA regions and the Nation. Moreover, with data spanning two time periods, potential trends can be identified. In the case of declining satisfaction for important attributes, managerial decisions may be needed to improve and sustain visitor satisfaction.

In this report we evaluate visitor perceptions of factors or attributes deemed relevant to outdoor recreation a priori, specifically ratings of attribute importance and satisfaction on NFs aggregated at the RPA regional and national levels. The report proceeds as follows. First, we discuss customer (visitor) motivations from consumer theory that underpin applications of IPA, followed by descriptions of IPA methodology. We then discuss the National Visitor Use Monitoring (NVUM) Program, which is the primary data source. We conclude with the Results section, covering not only the IPA implications regionally and nationally, but also the temporal changes between two successive periods of NVUM sampling spanning fall of 2005 to 2014. In closing, we note some caveats and potential future directions that could ensue from this work.

## IMPORTANCE-PERFORMANCE ANALYSIS

### Consumer Theory and Motivations

Importance-performance analysis (IPA) in recreation relies on perceiving the recreation visitor as a customer. In business, satisfied customers are linked to profitability (Anderson and others 1994). Anderson and others (1994) define cumulative customer satisfaction as the comprehensive assessments of buying and consuming a good or service through time. The customers' overall impressions of their transactions and returns may be used to gauge how the business is performing, serving also as markers of future potential. Additionally, positive customer impressions from multiple experiences can mean loyalty, favorable word of mouth, and further investments, translating to increased profits and business sustainability (Matzler and others 2004).

To develop strategies for sustained satisfaction in recreation, particularly on public lands, requires an understanding of participants' motivation and incentives. The human decisionmaking process is multifaceted, but a simplified model is necessary for a generalized approach. Push-pull theory describes two kinds of factors that are drivers of recreation (Ziegler and others 2012). Push factors are those elements that encourage recreationists to fulfill emotional desires, such as spending time with family or friends, seeking the excitement of a challenging activity, exploring solitude in the wilderness, or enjoying the serenity of natural scenery. Pull factors pertain directly to the recreation venue or activity, such as how safe a participant feels, availability of opportunities and sites, and the associated expenses. The decision to seek recreation may be explained by push factors; in turn, pull factors determine the activity of choice and location. How well recreation experiences satisfy the dynamics of push and pull factors determines how participants will engage over the long term. Participants enter a recreation decision with a perception, perhaps based on word of mouth, prior experiences, or anticipation of a first visit. The "disconfirmation of expectations" paradigm describes an inverse relationship between expectations and the subsequent experience (Sever 2015). A participant who invests time, money, and planning for a recreation trip enters with an expectation that his or her motivation will be met; if the outcome falls below expectations, then he or she will experience a negative disconfirmation (dissatisfaction). If the participant's perceptions exceed expectations, then the outcome is a positive disconfirmation (satisfaction).

A primary question in consumer science has been how to quantify and even define importance. Jaccard and others (1986) define importance as how consumers react to change.

If a change in the consumer's perception of an attribute's performance changes the view of that product or service, then that attribute is deemed important. Performance is more straightforwardly measured; the evaluation may be done post-experience, with comparisons against the expectations that the consumer formulated before entering the transaction(s). Ratings of importance may be direct or indirect, quantifying various facets of importance depending on the measure used (Jaccard and others 1986). Direct measurements are based on self-stated ratings such as Likert scales (Lego and Shaw 1992, Sever 2015). To circumvent potential biases with self-rating, an alternative is the use of indirect methods, which involve more complex statistical formulations using models or correlations. An implicit derivation of importance may be achieved by linking overall satisfaction to the set of attribute satisfaction levels (Abalo and others 2007). Because of the comprehensive scope of the overall satisfaction measure, this can implicitly contain information about the relative importance of each attribute. If the survey asks for satisfaction ratings only (overall and on individual attributes), omitting the importance scale translates to reduced rater fatigue and fewer potential sources of bias. However, this necessitates a more complicated analysis that diverges from the simplicity of traditional IPA. Techniques based on linear regression can extract relative importance by using the relationship between overall satisfaction and the set of attributes. However, the use of linear regression is problematic when attributes are collinear, and when attributes are not necessarily linearly related to overall satisfaction. So a simpler survey, based only on satisfaction ratings, has the tradeoff of a more complex analysis, with potentially invalid assumptions. The advantage of using both importance and satisfaction scales as in this study is that fewer assumptions require validation, and the processing of results is more straightforward, despite limitations inherent in analyzing Likert-type variables.

### Direct Measurements for Importance-Performance Analysis

**Methodology**—Martilla and James (1977) describe their development of IPA in the setting of an automobile dealer and examine, from a marketing perspective, the customer's experience. IPA is broadly applicable because of the relative simplicity of analysis methodology, in its most basic form requiring little statistical expertise and facilitating graphical interpretations. Additionally, it reduces a multifaceted process of human decisionmaking and evaluation to a set of numbers that can be analyzed and compared. The simplification is necessary to assess results from a general standpoint (Lai and Hitchcock 2015). Consequently, the method is applicable to a variety of settings, including recreation and tourism

(Albayrak 2015, Gill and others 2010, Huang and others 2015, Janes and Wisnom 2003, Lee 2015, Pan 2015, Sheng and others 2014, Sörensson and von Friedrichs 2013, To and others 2015, Ziegler and others 2012). Its simplicity and applicability make the method convenient to implement, albeit with some validity considerations discussed in the next paragraph and in the Conclusions section. These concerns have given rise to modified strategies that incorporate statistical complexity, but then the ease of application suffers. As such, practitioners tend to prefer the simpler approach and the use of any available explanatory power. We employ two variations of IPA known as the data-centered quadrants approach and the means and diagonal line model (Lai and Hitchcock 2015). We apply the methodology to recreation settings on NFs; we view the recreation visitors as customers rating their experiences, specifically the perceived importance and satisfaction levels of these experiences for a variety of setting-related attributes.

The original 1977 methodology occurs in three phases: attribute selection relevant to the product or service, rating of attributes by respondents, and computing means and thresholds for a two-dimensional plot (Martilla and James 1977). Essential to IPA are suitable designs for the survey and sampling techniques. Attributes used in evaluating responses through IPA are often formulated in advance based on expertise or prior research. These items should be relevant and responsive to managerial decisions, as improper or insufficient choices limit the detection powers of IPA (Martilla and James 1977). For example, if a survey includes an unimportant attribute, then the respondents' mean importance rating is likely to be low. Additionally, sampling expenses and efforts are expended unnecessarily if unimportant attributes are presented. The selected items of relevance can subsequently be used to identify key features and areas of improvement. Asking for both importance and satisfaction ratings supplies researchers with a two-dimensional perspective on the quality of experience for customers. The basic IPA methodology operates on a two-factor theory of customer satisfaction as outcomes based on the interactions of importance and satisfaction on a set of relevant attributes (Lai and Hitchcock 2015). IPA maintains an expectation-disconfirmation framework, where performance exceeding expectations produces satisfaction, and performance falling below expectations produces dissatisfaction (Sever 2015). Traditional IPA operates under the assumption of independence between importance and performance, as well as the linearity and symmetry of the relationship between overall satisfaction and performance (Lai and Hitchcock 2015). This approach may affect the validity of results from the IPA methodology applied without adjustments. However, some of the techniques developed to increase validity can be overly complex and are based on assumptions which are currently debatable.

Plotting importance against performance provides a snapshot of aggregate satisfaction and potential strategic planning for areas of improvement. Martilla and James (1977) formulated the quadrants approach for attributes, where thresholds established for importance and performance divide the plot into four sections:

1. **Relatively high importance, relatively high satisfaction:** The desired outcome. A quality that is deemed highly important and performing well means to “keep up the good work” (GW).
2. **Relatively high importance, relatively low satisfaction:** A highly important quality that is not performing well means that we should “concentrate here” (CH). Items falling into this quadrant over time suggest a situation in need of attention.
3. **Relatively low importance, relatively high satisfaction:** A potential indicator of overkill, in which resources are used on an area of low importance despite customers being satisfied; in a limited budget, the areas of “possible overkill” (PO) may be a starting point for shifting resources.
4. **Relatively low importance, relatively low satisfaction:** Though customers may not be as satisfied as they could be, the low importance attached to this quality indicates that this is an item of “low priority” (LP).

The difference between the threshold and mean of the attribute can indicate a deviation from the threshold in either a negative or a positive direction. Items performing very highly may appear in the extreme reaches of the GW quadrant, whereas attention may be needed for those appearing far into the CH section. However, the attributes whose means fall close to the thresholds may be inconclusive, especially with standard deviations such that confidence intervals of importance or performance span multiple quadrants.

Setting the thresholds is “a matter of judgment,” with options available such as using the center of the Likert scale, medians, or means (Martilla and James 1977, p. 79). Having a variety of ways to determine thresholds can be advantageous in that the analyses are flexible and adjustable to specific purposes; a downside is that there is no one-size-fits-all method, necessitating some judgment calls and perhaps the examination of multiple approaches. Thresholds based on the Likert scale (e.g., the scale midpoint) are scale-dependent, whereas those based on the observations are data-centered (e.g., median or mean). If a goal threshold is predetermined,

such as “at least somewhat satisfied” and “at least somewhat important” being expressed at 4 on a 5-point scale, then the crosshairs are target-driven (Lai and Hitchcock 2015). If attributes were removed from analysis or observations produced different values, then the thresholds in scale-centered and target-driven analyses are not affected. One advantage is that thresholds are convenient and systematic; however, this can be problematic if the means of the attribute all fall into the same quadrant. For example, a tendency toward ratings of 5’s for importance suggests that attributes can be well above a scaled center of 3 on a 5-point scale, thereby yielding an insensitive test. Data-driven thresholds, especially based on means, ensure finer partitions for the data points into the quadrant spaces per the four categories. Even so, research continues into how to best establish thresholds and to subdivide observations into the decisionmaking classifications (Lai and Hitchcock 2015).

In addition to setting thresholds for quadrants, another evaluation aid used by IPA analysts is the iso-priority line (Lee 2015). This is a diagonal line on which performance equals importance. This diagnostic indicates which items are of highest concern by using pairwise differences of satisfaction and importance as the measures for a more sensitive test (Ziegler and others 2012). In other words, the iso-priority approach reduces the two-dimensional analysis to one dimension, as used in service sectors (Albayrak 2015). A downside is that the test is less informative, using a division of only two spaces rather than the four classifications

seen in traditional IPA (Sever 2015). A hybrid approach can be formulated by overlaying an iso-priority line on the conventional IPA based on either scale- or data-centered thresholds. This method expands the potential area of concern (fig. 1). The distances can then be used to gauge how conclusively an attribute falls into a quadrant.

**IPA in recreation and natural resources**—IPA originated in the context of the automotive industry to better understand drivers of customer loyalty by using surveys of importance and satisfaction ratings on select attributes (Martilla and James 1977). Though there are multiple aspects to measuring importance, Martilla and James (1977) developed IPA using direct self-stated measurements on the importance (and satisfaction) on a 5-point Likert scale. Since then, the technique has been applied to many industries, including tourism and recreation. The methodology is now nearly four decades old, but applications are ongoing. With the many applications of IPA in recreation through the years, the articles discussed next are not an exhaustive list but are highlights. Research can take one of two forms: evaluating how to sustain customer satisfaction or comparing IPA methods (and variations) by using an example dataset in a recreation context. Furthermore, IPA may be used to compare groups hypothesized to demonstrate different behaviors, to make temporal comparisons (Leeworthy and others 2004), or to evaluate different classification methodologies. First, we discuss some applications of IPA in a general recreation setting and then those most relevant to this report.

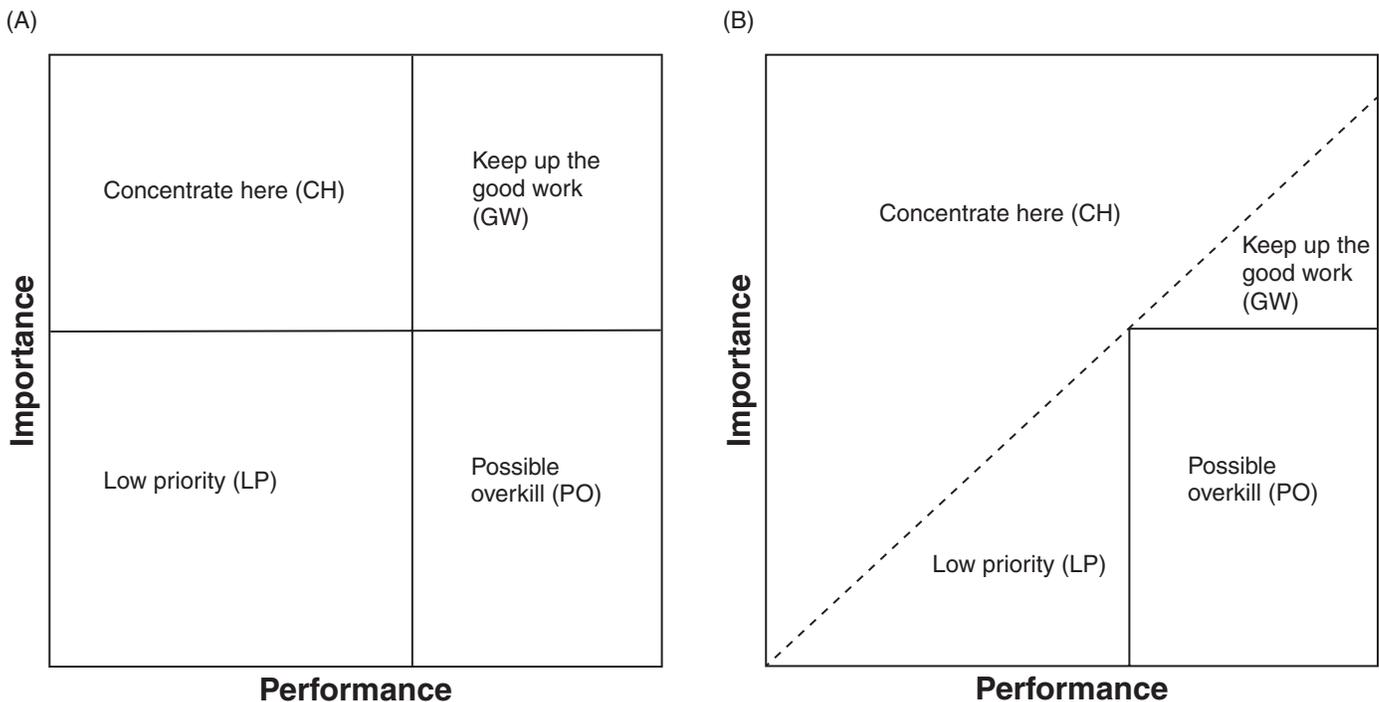


Figure 1—Traditional importance-performance analysis with thresholds (A) and a hybrid using the iso-priority line (B), shown as dashes, where the importance and performance are equal (Abalo and others 2007).

An early application by O’Leary and Adams (1982) used IPA on attributes identified through literature as potentially important for urban river corridor recreation, such as water quality, safety, and transportation. The responses came from two applications of the Urban River Recreation Survey, one in 1980 and the other in 1981, to three distinct user groups differing in attitudes toward recreation. The classifications were a function of scaled composite rankings based on ranked median importance values and ordered absolute values of Pearson correlation coefficients (between importance and performance). A comparison between 1980 and 1981 responses juxtaposed the attributes’ classifications by each quadrant. The 1981 responses facilitated a comparison of two user groups, black and white respondents, on their perceptions for that year.

IPA results depend on thresholds—and thus the plotting methodology. Crompton and Duray (1985) compared multiple plotting strategies on tourism data from British respondents. The respondents supplied their importance and performance ratings for various attributes of tourism in Texas, such as food and drink, availability of sandy beaches, and personal safety at their destination. Sörensson and von Friedrichs (2013) used IPA in the context of sustainable tourism, acknowledging the

need to maintain satisfaction amid limitations on available resources. Their application of IPA compared two groups with potentially different recreation patterns, Italian and international visitors to Bologna, Italy. In 2012, Ziegler and others used IPA with iso-priority lines to evaluate tourist satisfaction with whale shark viewing in Isla Holbox, Mexico. Lee (2015) used IPA and gap analysis (difference between mean importance and mean satisfaction) to gauge recreationists’ perceptions of public zoos in Korea and also analyzed the reliability and validity of attributes. Another recent application of IPA by Albayrak (2015) integrated competitor information in the tourism setting, specifically in five-star hotels in Antalya, Turkey, as part of a revised methodology known as Importance Performance Competitor Analysis (IPCA). The additional aspect allowed for the comparison of a focal hotel and a competitor, a dimension not available with basic IPA. Though not directly applicable to this research due to the noncompetitive nature of NFs, this example demonstrates an adaptation of conventional IPA and may be used in competitive recreation markets.

The IPA studies most relevant to our research are listed in table 1. Our analyses use aspects of these approaches, with novel application to NVUM responses for assessment of

**Table 1—Select applications of importance-performance analysis (IPA) in recreation settings by year, author, general methodology, and context**

Year	Author(s)	Methodology	Context	Number of attributes	Sample size
1982	O’Leary and Adams	IPA, ranking and Pearson correlation coefficients, separate analyses of two groups	Urban river recreation	Year 1980: 48; year 1981: 44	Year 1980: 181; year 1981: 118
1985	Crompton and Duray	IPA, comparison of four plotting methods	British tourists on aspects of visits to Texas	28	544
2004	Leeworthy, Wiley, and Hospital	IPA, intertemporal comparisons on two time periods for distinct user groups	Artificial and natural reef usage, recreation and tourism for Florida Keys National Marine Sanctuary	25	1995–96: 917 visitors, 455 residents; 2000–01: 275 visitors, 609 residents
2010	Gill, Bowker, Bergstrom, and Zarnoch	IPA with weighting by inverse number of trips	Usage of Virginia Creeper Trail, Virginia	17	1,308
2012	Ziegler, Dearden, and Rollins	IPA, iso-rating line, gap analysis (paired <i>t</i> -tests)	Whale shark tourism in Mexico	15	397 total, 90% response rate
2013	Sörensson and von Friedrichs	Sustainable tourism, comparison of two groups	Destination: Bologna, Italy	24	150 international tourists, 139 Italian visitors
2015	Albayrak	Importance-Performance Competitor Analysis (IPCA)	Five-star hotels in Antalya, Turkey	38	478
2015	Lee	IPA, factor analysis, gap analysis, attribute reliability	Public zoos in Korea	23	697

satisfaction by RPA region. Gill and others (2010) applied IPA in the setting of the Virginia Creeper Trail (Virginia). They obtained a stratified random sample similar to NVUM. Length-of-stay bias and endogenous stratification bias (bias stemming from the fact that the probability of a recreationist being sampled at a given site is related to the number of times he or she visits; Gill and others 2010, Shaw 1988) are inherent in onsite sampling. The former was not problematic for NVUM due to the policy of sampling last-exiting recreationists (LERs). The latter can be adjusted through inverse weighting by annual number of trips taken (see Data Description for a more detailed discussion). This approach treats the responses of a daily visitor as the same as those of an annual recreationist, so all responses are equally important. Gill and others (2010) found that weighting to account for endogenous stratification could lead to conclusions different from the naïve (or unweighted) approach, typically followed in IPAs, for several trail attributes including safety/security, crowding, parking, and trail structures.

Leeworthy and others (2004) not only examined distinct user groups (experienced vs. inexperienced, visitors vs. local residents) but also carried out an analysis between two time periods. The application was in the context of artificial and natural reefs in a Florida community, specifically as part of the recreation and tourism analysis for the Socioeconomic Research and Monitoring Program for the Florida Keys National Marine Sanctuary. The survey was applied over multiple years (1995–96 and 2000–01), similar to NVUM, but with shorter, nonconsecutive periods. The respondents in the two time periods were assumed independent, which is also similar to NVUM, so the responses did not warrant a paired before/after comparison. Leeworthy and others (2004) compared the two periods by *t*-testing attributes across time periods within the distinct user groups, noting whether satisfaction and importance levels changed and in what direction. Their methods did not account for endogenous stratification.

In the present research, we used intertemporal comparisons testing as in Leeworthy and others (2004), specifically testing importance and satisfaction across two sampling periods (i.e., NVUM rounds 2 and 3). We also incorporated the weighting procedure put forth by Gill and others (2010). Our analyses were conducted across multiple regions and site types, evaluating for commonalities in test output.

## Data Description

The data source for our IPA study was the NVUM Program. This program has the objective of estimating visitation volume for recreationists on NFs and analyzing visitation with respect to attributes such as activity participation, visit

duration, demographics, and satisfaction levels (USDA Forest Service 2016). Only LERs are eligible to answer the survey, which ensures that responses are from those using the sites/forests for recreation, and that double-counting is avoided. The NVUM sampling screens whether a person has recreated on the site/forest, proceeding with the interview only after an affirmative answer. The survey is onsite and collects information immediately after a visit (English and others 2002). Though a mail-back or Internet response format may permit time to reflect and evaluate post-trip, the onsite survey asks recreationists to present their impressions from recent memory and recall upon concluding the trip. The survey includes information about the recreation site being exited and respondents' home ZIP codes if supplied. Respondents are asked about their current visit, and also about their visitation to the NF over the previous 365 days.

The NVUM survey consists of three major variations: basic questions (asked of everyone), an economics module (asked of a subset along with the basic questions), and a satisfaction module (asked of a subset along with the basic questions). The basic module focuses on demographics and respondents' recreation habits by activity. Those who receive the satisfaction module are asked about satisfaction and importance levels for attributes and perceptions of crowding.

The NVUM methodology employs stratified random sampling (Cochran 1977) of site days on each forest, considering use levels and site types (English and others 2002). There are four site types: day-use developed sites (DUDS), general forest areas (GFA), overnight-use developed sites (OUDS), and designated Wilderness (WILD). Persons using DUDS or OUDS encounter facilities with moderate, heavy, or high degrees of modification per the Forest Service's Infrastructure (INFRA) development scale, with OUDS affording opportunities to stay overnight in campgrounds, cabins, lodges, or resorts (English and others 2002). Visitation to DUDS involves participation in activities that may occur in picnic areas, fishing sites, playgrounds, or visitor centers, to name a few. WILD consists of lands and waters under the jurisdiction of the National Wilderness Preservation System. GFA include any NF components remaining outside the DUDS, OUDS, and WILD classifications (English and others 2002). Variations may occur in site-type visitation due to activity opportunities on each. For example, motorized activities are not permitted in WILD, but could occur in either of the developed site types and in designated areas within GFA.

A sample that is not homogeneous due to known characteristics must be segmented in order for IPA to be effective. This permits comparisons of distinct groupings for strategic planning (Lai and Hitchcock 2015, Leeworthy and

others 2004). Distributions of sampling days by site type and Forest Service region under the NVUM methodology permit analysis of attributes relevant to each segment. By stratifying according to site type, the variations are more finely divided so that the sources of variation can be identified. In sampling design, accounting for use levels through exit volumes (low, medium, high, or very high) ensures sufficient sampling across site types within budgetary constraints (Askew and others 2014). Our analysis examined the site types by region as the finest resolution. However, as will be discussed in the Conclusions section, future work in testing mean ratings will need to adjust for the sampling being carried out at multiple use levels across site types.

The nature of the NVUM sampling procedure produces data that are endogenously stratified (Gill and others 2010, Shaw 1988). The sampling process allocates a certain number of sampling days within a period for each site/forest. More-frequent visitors have higher probabilities of being sampled, which necessitates adjustment to statistics describing individuals' behaviors (as opposed to overall visitation). The problem of bias resulting from endogenous stratification is rarely recognized or acknowledged in studies applying IPA to onsite data. To our knowledge, the report by Gill and others (2010) has been the only IPA study to address this issue and offer a corrective procedure, weighting respondents' values by the inverse of their reported annual visits. Weighting by the inverse of a respondent's forest visits in a year, the statistics view the recreationist who participates 365 days annually in the same way as a one-time visitor. Furthermore, if the parameters of interest are dependent on trip frequency, then there is a possibility of trip frequency bias (Gill and others 2010), which again can be mitigated through weighting by the inverse of the annual number of trips.

The national data collection processes the site/forest of interview, so the observations can be refined at a regional level or even forest-by-forest analysis. The Forest Service regions shown in figure 2(A) can be aggregated into RPA regions as shown in figure 2(B), where the North and South RPA regions correspond to Forest Service Regions 9 and 8, respectively. The Rocky Mountain RPA region is an aggregate of Forest Service Regions 1, 2, 3, and 4. Last, the Pacific Coast RPA region comprises Forest Service Regions 5, 6, and 10.

The NVUM survey was first implemented from 2000 to 2003 (round 1). The methodology was significantly revised in 2004, with subsequent implementation in 2005. Because of the methodological change, round 1 is not comparable to subsequent rounds (5-year sampling cycles); thus, the responses for round 1 can be viewed as archival and descriptive only for that period. The methodological revisions

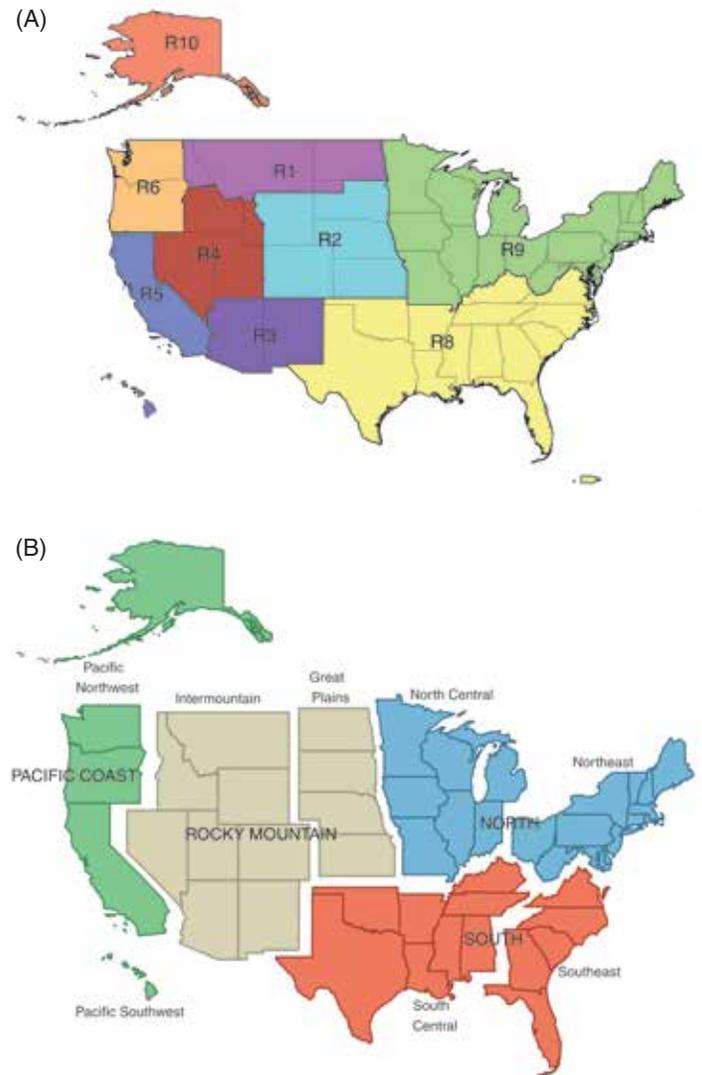


Figure 2—Delineation of the United States into (A) Forest Service (FS) regions (R) and (B) FS regional aggregates known as RPA regions.

improved on the consistency of estimation and sampling procedures (English and others 2002, Zarnoch and others 2011). The end product of the periodic sampling is survey data collected from all NFs through appropriate prework and fieldwork. Approximately 20 percent of forests are surveyed in a given year, producing a full dataset after a completed round. The years from FY2005 to FY2009 make up round 2, and FY2010 to FY2014 correspond to round 3. Because of the improvements, a consistent and nationally available framework is now in place that will permit temporal trend comparisons as more data and time points become available. The strength of this survey process makes it a desirable candidate for application to future recreation analyses for RPA Assessments and Updates.

Figure 3(A and B) shows that for each of the two rounds, the three NVUM survey types were divided roughly equally among the respondents, with a somewhat greater percentage receiving only the basic component, as opposed to the basic plus economics module or the basic plus satisfaction module. The analyses in this study focus on the data collected for the satisfaction module.

The NVUM survey contains a pool of 16 attributes generally describing conditions at DUDS, GFA, OUDS, and WILD. The attributes were determined by using expert knowledge, specifically from NVUM Program and National Forest System (NFS) staff in conjunction with forest-level personnel. The selection process incorporated prior satisfaction research on Federal lands and interviews with Forest Service managers

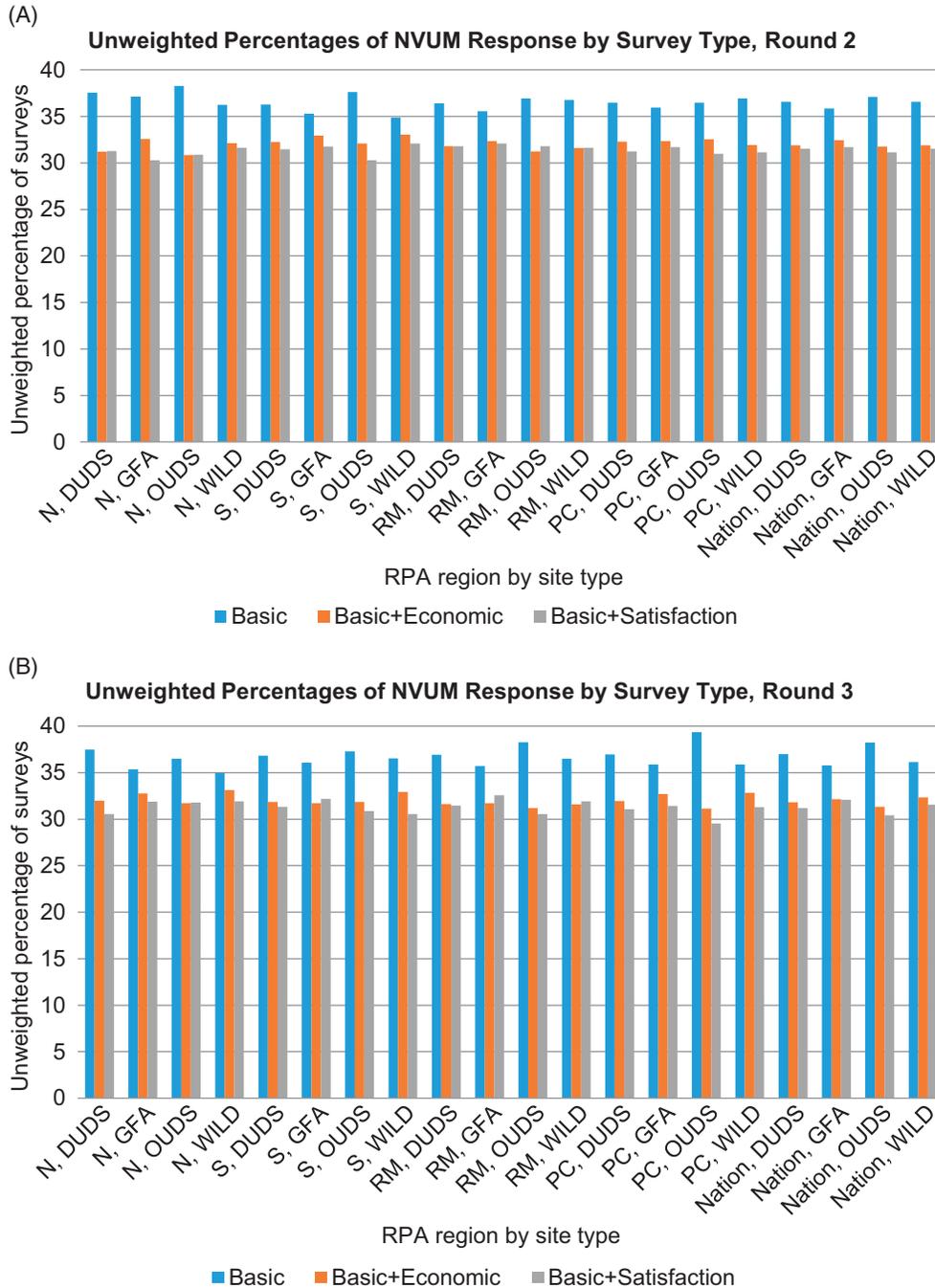


Figure 3—Percentages of National Visitor Use Monitoring responses by survey type administered, by region and site type, for (A) round 2 and (B) round 3. RPA regions: N=North; S=South; RM=Rocky Mountain; PC=Pacific Coast. Site types: DUDS=day-use developed sites; GFA=general forest areas; OUDS=overnight-use developed sites; WILD=designated Wilderness.

on the most important aspects. Incorporating feedback from managers in the NVUM survey connects user responses to potential action items.

Respondents were presented with a set of predetermined relevant attributes and corresponding 5-point Likert scales for evaluating their visits to the NF. According to Martilla and James (1977), having a 5- or 7-point Likert scale presents a sufficient set of options for respondents, potentially dispersing the ratings more and producing a more useful range than a 3-point scale would. Though the 5-point scale is most common, Lai and Hitchcock (2015) suggested a new standard of at least a 7-point scale for subsequent IPA strategies. In the interest of continuity and the ability to compare NVUM responses through time, the current 5-point scale will be retained for NVUM.

Presenting too many options can lead to choice overload, where respondents find it more difficult to make decisions or selections (Gourville and Soman 2005). The survey must balance asking for sufficiently well-defined ratings of attributes on an appropriate Likert scale and preventing rater fatigue. For each of the 16 available attributes in NVUM, respondents could rate their levels of satisfaction and the importance they attached to the attribute. Satisfaction ratings were (1) “very dissatisfied,” (2) “somewhat dissatisfied,” (3) “neither satisfied nor dissatisfied,” (4) “somewhat satisfied,” and (5) “very satisfied,” along with an option to specify “not applicable.” Importance ratings ranged from (1) “very unimportant” to (5) “very important.” For both scales, the value (3) represents a neutral answer.

The original set of attributes in the NVUM satisfaction survey are as follows, with abbreviations for easier referencing:

1. Adequacy of signage on this forest as a whole (TOTALSIGNS)
2. Condition of roads on this forest as a whole (TOTALROADS)
3. Scenery at this site/area (SCENERY)
4. Condition of the natural environment (NATENVR)
5. Available parking (PARKING)
6. Parking lot condition (PARKINGLOT)
7. Cleanliness of restrooms (CLEANLINESS)
8. Condition of developed recreation facilities (DEVFACILITIES)
9. Condition of forest roads (ROADS)
10. Condition of forest trails (TRAILS)
11. Feeling of safety (SAFETY)
12. Helpfulness of employees (not interviewer) (HELPFULNESS)
13. Availability of interpretative/educational displays, signs, and exhibits (DISPLAYS)
14. Value for fees paid (for fee sites only) (VALUE)
15. Availability of information on recreation about this site (RECINFO)
16. Adequacy of signage to this site (SIGNAGE).

A subset of 11 attributes was selected for IPA analysis: NATENVR, SCENERY, SAFETY, TRAILS, VALUE, ROADS, PARKING, SIGNAGE, DEVFACILITIES, CLEANLINESS, and PARKINGLOT. These are of primary interest, and the reduction in the number of attributes considered creates a workable set for presentation of results, with the procedure in place for further analysis as needed. As the analysis is linked to site type, attributes referring to the forest signs and roads as a whole were not considered. Moreover, each attribute does not necessarily apply to all four site types. For instance, how satisfied a recreationist was with the developed recreation facilities does not pertain to the WILD stratum, which is devoid of developed facilities. Thus, attributes analyzed for all four site types were NATENVR, SCENERY, SAFETY, TRAILS, and VALUE. Subsequently, ROADS, PARKING, and SIGNAGE were analyzed for all but the WILD stratum. Last, DEVFACILITIES, CLEANLINESS, and PARKINGLOT were evaluated only for the developed site types, DUDS and OUDS.

The NVUM survey also contained two measures potentially useful in evaluating user satisfaction levels. The basic module asked for respondents’ overall satisfaction levels with the visit to the NF, from (1) “very dissatisfied” to (5) “very satisfied.” The satisfaction module included a 10-point Likert scale for crowding, from (1) “hardly anyone” to (10) “overcrowded.” Intertemporal analyses were applied to overall satisfaction and perceived crowding levels. The results together with IPA provided an expanded perspective on recreation, specifically from a psychological perspective rather than a physically measurable quantity, such as accessible land acreage.

## RESULTS

### NVUM Sample Characteristics

Sample size should be adequate to reduce variance and yield potentially significant results. However, there is also a cost tradeoff with increased sampling for accuracy under budgetary constraints already in place. NVUM prework considers the budgets and the necessary sampling per expertly formulated methodologies. In terms of IPA, the minimum sample size needed is a function of the number of attributes asked in the questionnaire, with a 1:4 recommendation in the 1970s, a 1:10 ratio a decade later, and currently 1:20 (Lai

and Hitchcock 2015). With DUDS and OUDS, we evaluate 11 attributes, compared to 8 for GFA, and 5 for WILD. Thus, the minimum sample by today's standard would be 220 for the developed sites, 160 for GFA, and 100 for WILD. The only attribute that does not meet this on a regional and round basis for importance and satisfaction is that of VALUE in South WILD, with 75 and 91 observations in round 2, respectively, and 61 and 78 in round 3. Though the 1:20 ratio does not hold, the 1:10 ratio is satisfied. WILD does not have as much visitation as the developed sites, which is reflected in the sampling's lower but adequate sample sizes for NVUM estimation. Additionally, because fees do not generally apply to WILD sites, VALUE is not as relevant to the wilderness experience, in contrast to natural aspects such as SCENERY and NATENVR. Sampling sizes are more than adequate across the site types and rounds when examined on a national basis.

### Purpose of Visitation

The temporal aspect of sampling is also important in evaluating recreationists. To gauge recreationists' perceptions of importance related to attributes, it is better to sample before the experience to understand the decisionmaking leading up to recreation (Oh 2001). The ratings are then based on the recreationists' preconceived notions of what they are looking for from the experience, as well as the standards to which they will hold the subsequent trip for recreation. On the other hand, post-visit sampling provides insight into their satisfaction, namely their perceptions of performance. This allows for the respondents to compare their just-concluding visit to the framework of expectations with which they entered (Lai and Hitchcock 2015, Oh 2001). Due to the expense of sampling, conducting both pre- and post-visit interviews is not feasible for NVUM. Budget constraints already exist on distributing sampling days for onsite interviews. An onsite interview of first-entering recreationists would only evaluate importance from expectations unaffected by the subsequent visit; this setup would not measure satisfaction levels without some follow-up by mail, Internet, or phone. The post-trip components would require additional funds in survey collection, as well as more effort from respondents after their trip. Under the NVUM's LER-sampling protocol, the recent nature of the trip promotes more accurate recall of satisfaction. Though there may be some loss in the integrity of the importance assessment, this potential tradeoff is necessary to meet budgetary constraints.

The NVUM sampling prescreens so that respondents are only those who used the site/forest for the primary purpose of recreation. Respondents are able to further refine their responses according to four purposes for the recreation trip to the NF: primarily for recreation on this NF, which was the

main destination; primarily for recreation but with a main destination other than this NF; primarily for business, family, or other reasons, with this NF visit a side trip; or some other reason. Figure 4(A and B) shows that most respondents by region and site type were visiting primarily for recreation at the NF. The smallest groups were from those who had other reasons, followed by those who visited as a side trip while traveling due to business, family, or other. Visitors who decided on the NF as a primary destination for recreation were the majority particularly among the OUDS, WILD, and GFA strata at both regional and national levels.

### IPA Results: Temporal Analysis and Attribute Classifications

In keeping with the simplicity of application, NVUM data were analyzed for RPA regional and national comparisons by using data-centered traditional IPA and a modified approach using the iso-priority line. Due to the high means, the scale-centered approach with thresholds at 3 would not be very informative from a relative perspective. The target-driven method is also not well-suited to the high means. If the goal were to achieve at least some satisfaction on somewhat or very important items, then the thresholds for both measures would be set at 4. In this case, the relatively high means for importance and satisfaction would place all attributes in the "good work" (GW) quadrant. Another consideration with the target-driven method is that each attribute may not correspond to the same goal levels. Therefore, the data-centered approach was most appropriate, with grand mean importance and satisfaction ratings more effectively subdividing the attributes into one of four actions.

Expression of the Likert-type variables as integers, such as a single attribute rating studied for IPA, permits testing but with some limitations. Multiple candidate tests for Likert-type variables each have their own statistical issues and assumption violations. In many research outlets ranging from social science to marketing, discussion arises about whether parametric methods may be validly applied to Likert data (de Winter and Dodou 2010). Likert-type items are individual ratings, whereas a Likert scale is a summation over a group of individual ratings (Clason and Dormody 1994). Likert-type items are ordinal, but coding them as numeric assumes a discrete distribution with uniform spacing between integer ratings. In reality, the distance between "somewhat satisfied" and "neither satisfied nor dissatisfied" may not be the same as between "somewhat satisfied" and "very satisfied." Additionally, coding importance as 1 to 5 does not necessarily equate to the corresponding integer on the satisfaction scale (other than the neutral integer of 3). However, coding preserves the relative positioning along the scales.

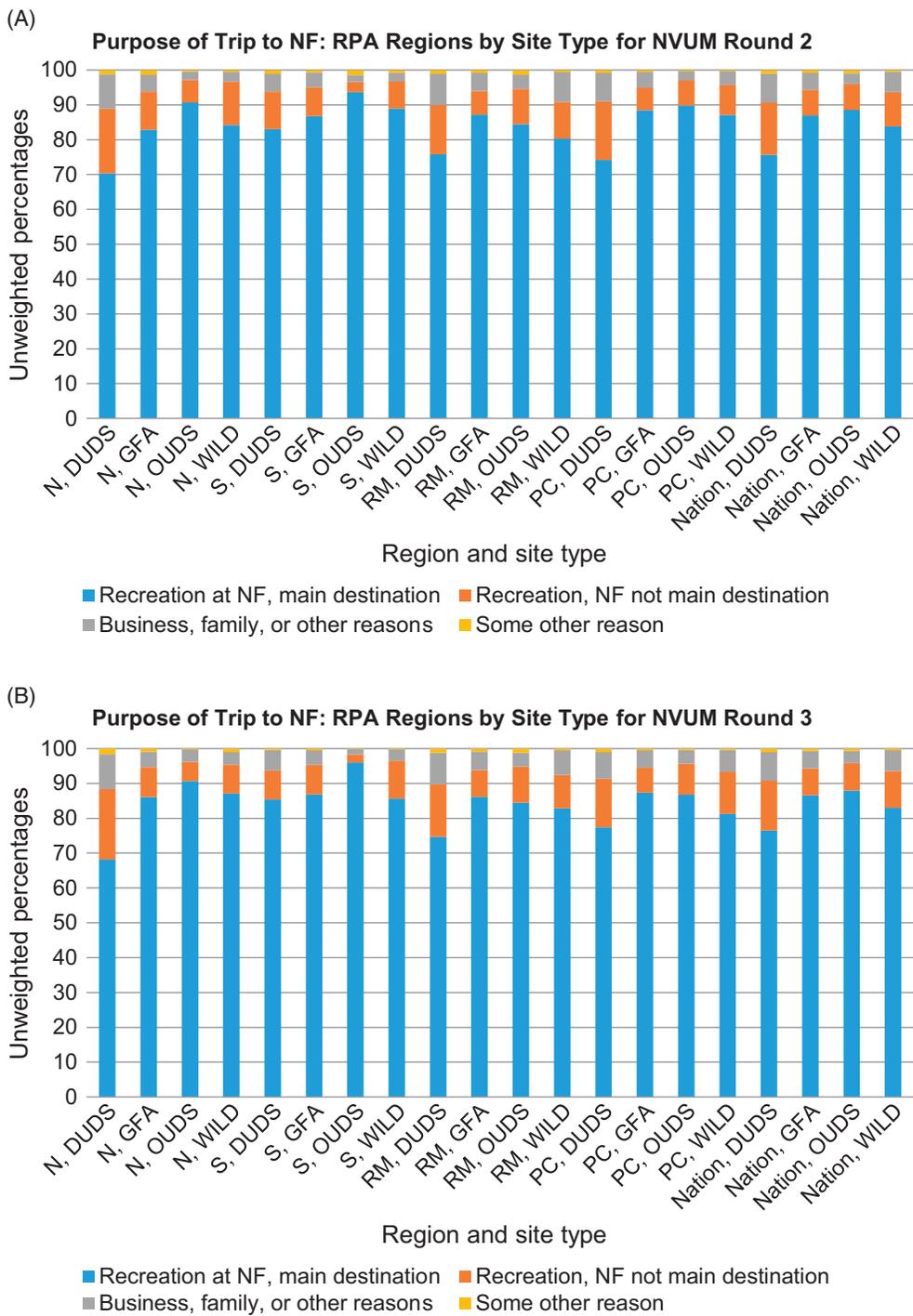


Figure 4—Percentages of National Visitor Use Monitoring responses by purpose of the recreation visit to the national forest (NF) site for (A) round 2 and (B) round 3. RPA regions: N=North; S=South; RM=Rocky Mountain; PC=Pacific Coast. Site types: DUDS=day-use developed sites; GFA=general forest areas; OUDS=overnight-use developed sites; WILD=designated Wilderness.

Leeworthy and others (2004) used a temporal comparison of IPA scores on 5-point Likert scales with respect to 25 attributes on natural resources, facilities, and services through two-sample *t*-testing. We also used parametric two-sample *t*-testing on 5-point Likert scales. Future research could compare the results obtained from nonparametric and parametric methods, but in any case, a precedent in parametric methodology would be necessary. Therefore, using two-sample *t*-testing, we integrated a temporal aspect into IPA on the NVUM satisfaction module data, constructing a framework illustrating IPA scores over two 5-year sampling lags.

Because only two complete NVUM rounds were available, we begin with a snapshot trend to observe how, or if, the attributes change going from round 2 to round 3. With two time points, we used the thresholds of round 2 values as baselines. This allowed for the observation of trends over time, noting possible downslides or improvements by attribute. If a trend showed an attribute gradually falling into the “concentrate here” (CH) classification, or movement from below the iso-priority line to above it, then the temporal evaluation allows for advance strategic planning.

The distributions of responses from the NVUM satisfaction and importance data were generally left skewed, as there was a predominance of ratings of 5, which skewed the weighted means upwards. This consistent phenomenon is illustrated in figure 5, which shows the frequency of weighted responses

for DUDS in the North. Figures 6 to 9 represent the results for WILD, GFA, DUDS, and OUDS, respectively, by RPA region for rounds 2 to 3. It is important to note the scale of the axes, as the ranges are a relatively narrow segment of the 5-point scale. Therefore, the overall NF recreation experience, as captured by the attributes, was rated very high in terms of performance and importance. Nevertheless, we computed relative comparisons to potentially inform managers in resource allocation, and to identify potential trend shifts from round 2 to round 3. Because managerial implications take place by site type, the analysis examined the implications of the attributes by site type and then scanned for commonalities across regions and the Nation.

An important note is that NVUM surveys are administered through a complex, multistage sampling design on strata. Prework allocates sampling days for each forest, depending not only on site type but also use level (i.e., low, medium, high, or very high). This work describes a basic application of IPA on respondents by site type, as if the surveys were obtained through simple random sampling, rather than addressing the underlying stratifications on both site type and use level. The more complex analysis would potentially be a future research direction, with this simplified analysis in place for comparison.

We next present the results by site type for WILD, GFA, DUDS, and OUDS: first by the quadrants approach, then by use of the more stringent iso-priority line. Some attributes are

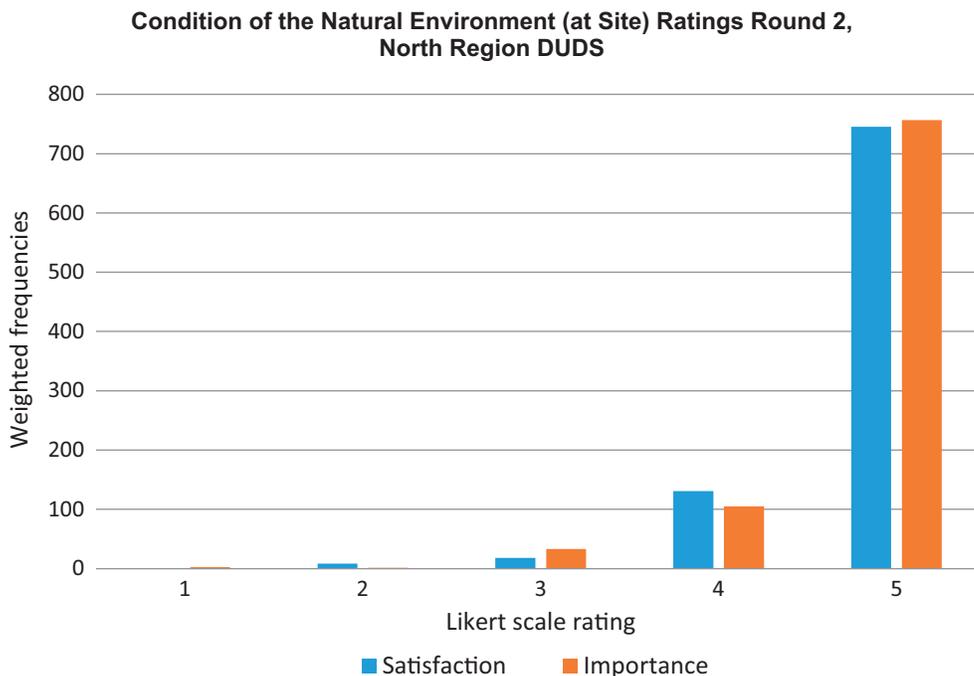


Figure 5—Weighted frequencies (by inverse annual number of trips) of satisfaction and importance ratings on condition of the natural environment for North day-use developed sites (DUDS) in round 2.

classified differently with the latter approach compared to the quadrants approach. Though attributes below the iso-priority line do not change classifications, those above the diagonal line may be classified as “keep up the good work” (GW) under the quadrants approach but shift to “concentrate here” (CH). The iso-priority line operates under the assumption that the recreationists’ satisfaction should at least match their expectations (i.e., satisfaction should match or exceed preconceived importance levels).

### Designated Wilderness

For the WILD site types at the national and RPA regional levels, five site-specific attributes were analyzed: NATENVR (condition of the natural environment), SCENERY (scenery at this site/area), SAFETY (feeling of safety), TRAILS (condition of forest trails), and VALUE (value for fee paid, if applicable). The complete satisfaction module from the NVUM questionnaire is available on request from the authors.

**Attribute classifications for WILD**—Diagrammatic IPA results for both the quadrants approach and the iso-priority line approach are shown in figure 6. The quadrants approach indicated that none of the attributes fell squarely into the CH section in either time period. In fact, the two attributes reflecting SCENERY and NATENVR, perhaps most applicable to the character of wilderness, remained in the GW quadrant in both time periods, with apparent movement toward increased satisfaction over time, except for SCENERY in the South. Statistically significant gains (table 2) occurred in satisfaction alongside generally static importance in both attributes for the Rocky Mountain and Pacific Coast regions and the Nation. For the attribute of SCENERY, importance ratings increased significantly in the North region and for the Nation; North satisfaction levels remained static with increasing levels of importance between rounds.

The IPA scores for TRAILS remained in the LP quadrant through both time periods for the Nation and all regions except for the Rocky Mountain, despite increases in both importance and satisfaction for the Rocky Mountain region. A further increase in importance relative to satisfaction could conceivably push TRAILS into the CH quadrant in subsequent time periods. A statistically significant decline occurred in the satisfaction levels of TRAILS for the South with static importance, the only significant downturn observed for the WILD site type. Growth in both satisfaction and importance of TRAILS ratings occurred for the Rocky Mountain region, along with increasing importance and static satisfaction for the Pacific Coast and Nation.

Two attributes more closely associated with human use than nature are SAFETY and VALUE. In the case of VALUE, a quadrant shift from LP to PO occurred for the North and Rocky Mountain regions and Nation. Significant increases in both satisfaction and importance over time were observed for VALUE for the North and the Nation. These results suggest that visitors continued to be very pleased with their wilderness recreation experience relative to any site fees that were encountered. SAFETY, a very high priority in the Forest Service at all levels, appeared in the PO quadrant for both time periods, with the exception of the South. Both importance and satisfaction improved from round 2 to round 3 for the Rocky Mountain region and the Nation; increasing satisfaction with static importance occurred for the attribute in the North. Should importance increase relative to satisfaction by the next round, this attribute could approach the GW quadrant in all regions and the Nation.

An alternative perspective at the national level using the iso-priority line approach indicated that four of the five attributes are not in need of attention, as their satisfaction ratings exceeded their importance ratings. For NATENVR, the rating importance exceeded satisfaction, indicating that some concern may be warranted. However, the temporal movement across periods showed an increase in satisfaction in NATENVR but no change in importance. Overall, for wilderness visitors on NFs, it is important to note that at the national level, all wilderness attributes showed increases in satisfaction ratings, and four of the five showed increases in importance ratings.

**Intertemporal analysis for WILD**—Attributes with increased satisfaction and importance in round 3 for WILD were SCENERY for the Pacific Coast and the Nation, SAFETY for the Rocky Mountain region and the Nation, TRAILS in the Rocky Mountain region, and VALUE in the North and the Nation. The largest growth in satisfaction for WILD occurred in VALUE for the North, shown in the shift from LP to the threshold between GW and PO; VALUE was also the attribute with the greatest growth in importance. Recreationists using North WILD were very satisfied with their experience relative to any fees they paid, and this attribute became increasingly important.

The only statistically significant downturn in satisfaction for WILD occurred in the South for TRAILS (table 2). Though this result did not necessarily signal an immediate concern for TRAILS, the trend could point to a future need for maintenance or improvement if importance increases.

Site Type WILD

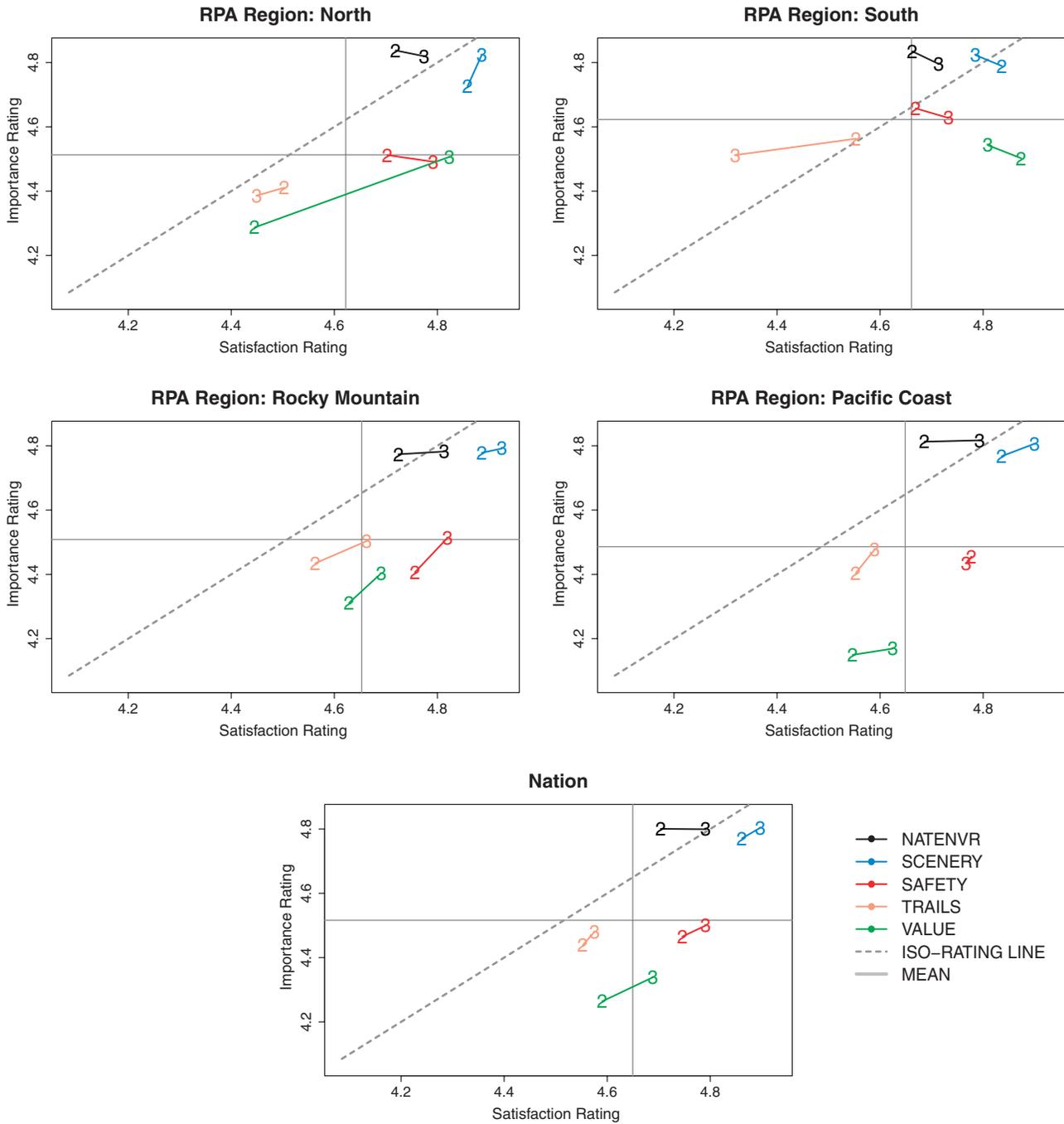


Figure 6—Importance-performance analysis for designated Wilderness (WILD) with weighting by inverse annual number of trips on five attributes across the four RPA regions and the Nation, from round 2 to round 3, with quadrants and hybrid iso-priority line approaches.

**Table 2—Rates of change between weighted means for satisfaction (satis) and importance (import) between rounds across Resources Planning Act regions and the Nation for designated Wilderness (WILD), with significance determined by parametric two-sample t-testing**

Attribute	WILD									
	North		South		Rocky Mountain		Pacific Coast		Nation	
	Satis	Import	Satis	Import	Satis	Import	Satis	Import	Satis	Import
NATENVR	1.17%	-0.37%	1.11%	-0.82%	1.88%**	0.18%	2.28%**	0.09%	1.85%**	-0.03%
SCENERY	0.57%	2.07%**	-1.06%	0.71%	0.80%**	0.28%	1.33%**	0.82%	0.73%**	0.70%**
SAFETY	1.90%**	-0.46%	1.36%	-0.64%	1.33%**	2.44%**	-0.21%	-0.47%	0.94%**	0.76%
TRAILS	-1.18%	-0.56%	-5.15%**	-1.12%	2.18%**	1.55%**	0.81%	1.67%**	0.50%	0.93%**
VALUE	8.50%**	5.12%*	-1.33%	0.90%	1.34%	2.13%	1.71%	0.47%	2.14%**	1.75%*

Attributes: NATENVR=Condition of the natural environment; SCENERY=Scenery at this site/area; SAFETY=Feeling of safety; TRAILS=Condition of forest trails; VALUE=Value for fees paid (for fee sites only).

\*Statistically significant for  $\alpha = 0.10$

\*\*Statistically significant for  $\alpha = 0.05$

Positive rate of change (significant)

Negative rate of change (significant)

Following are summarized managerial implications from the data-centered quadrants approach for the RPA regions and the Nation in the WILD site type. Borderline results are indicated by regions in italics.

**Concentrate here (Relatively high importance, relatively low satisfaction)**

- None

**Keep up the good work (Relatively high importance, relatively high satisfaction)**

- Scenery at this site/area (All)
- Condition of the natural environment (All)
- Feeling of safety (*South* and *Rocky Mountain*)

**Low priority (Relatively low importance, relatively low satisfaction)**

- Condition of forest trails (North, South, *Pacific Coast*, and Nation)
- Value for fee paid (*Pacific Coast*)

**Possible overkill (Relatively low importance, relatively high satisfaction)**

- Feeling of safety (North, *Pacific Coast*, and *Nation*)
- Value for fee paid (*North*, South, Rocky Mountain, and Nation)
- Trails (Rocky Mountain)

**Potential shifts to area of concern per iso-priority line (i.e., satisfaction did not equal or exceed perceived importance)**

- Scenery at this site/area (South)
- Condition of the natural environment (North, South, *Pacific Coast*, and *Nation*)
- Condition of forest trails (South)

## General Forest Areas

In addition to the five attributes analyzed for WILD, the analysis of GFA incorporated ROADS (condition of forest roads), PARKING (availability of parking), and SIGNAGE (adequacy of signage to this site) (fig. 7). These additional attributes explain how visitors using a vehicle perceived navigating and arriving at the site.

**Attribute classifications for GFA**—When the quadrants method was used, none of the attributes fell squarely into the CH classification. Some of the attributes produced results close to the thresholds; for example, TRAILS in the Rocky Mountain region and the Nation shifted from LP to just inside the CH classification. If importance were to increase relative to satisfaction for the next round, this attribute could be of concern, especially considering that trails are a part of the recreation experience for many activities on GFA.

For GFA, the NATENVR, SCENERY, and SAFETY attributes performed the best overall, appearing in the GW area. These results indicated that visitors felt safe overall and experienced fulfilling natural conditions for recreation. If importance declines significantly relative to satisfaction into round 4, the attributes for the South could shift to PO. SCENERY tended to surpass the other two attributes in satisfaction; NATENVR was associated with greater importance. Statistically significant gains in satisfaction along with static importance occurred in NATENVR and SCENERY for the Pacific Coast, SCENERY for the Nation, and SAFETY for the North (table 3). Visitors in these regions were more satisfied with the respective attributes in round 3 than in round 2, while attaching the same levels of importance temporally. SAFETY became a more important attribute with static satisfaction in the Rocky Mountain region. The only significant declines among these three

Site Type GFA

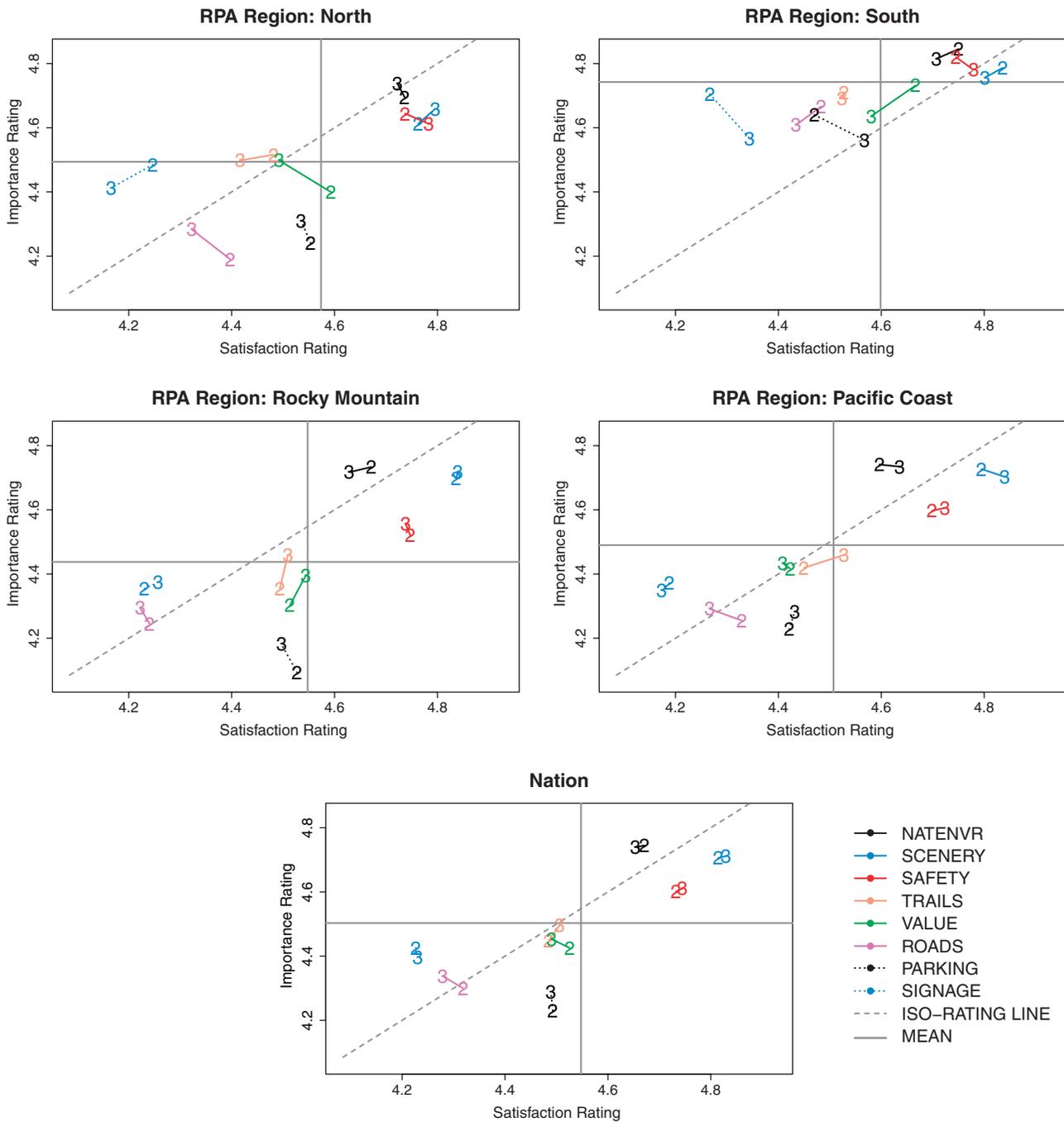


Figure 7—Importance-performance analysis for general forest areas (GFA) with weighting by inverse annual number of trips on eight attributes across the four RPA regions and the Nation, from round 2 to round 3, with quadrants and hybrid iso-priority line approaches.

**Table 3—Rates of change between weighted means for satisfaction (satis) and importance (import) between rounds across Resources Planning Act regions and the Nation for general forest areas (GFA), with significance determined by parametric two-sample t-testing**

Attribute	GFA									
	North		South		Rocky Mountain		Pacific Coast		Nation	
	Satis	Import	Satis	Import	Satis	Import	Satis	Import	Satis	Import
NATENVR	-0.30%	0.92%	-0.90%	-0.62%	-0.92%**	-0.34%	0.86%*	-0.14%	-0.38%	-0.12%
SCENERY	0.69%	1.01%	-0.72%	-0.64%	0.07%	0.44%	0.94%**	-0.51%	0.31%*	0.13%
SAFETY	0.98%*	-0.69%	0.72%	-0.83%	-0.19%	0.79%*	0.54%	0.20%	0.26%	0.22%
TRAILS	-1.46%	-0.40%	-0.08%	-0.40%	0.35%	2.35%**	1.75%**	0.91%*	0.47%	1.06%**
VALUE	-2.20%	2.24%	-1.84%	-2.02%*	0.69%	2.17%**	-0.33%	0.39%	-0.77%	0.62%
ROADS	-1.69%	2.21%*	-1.09%	-1.25%*	-0.43%	1.15%**	-1.44%*	0.86%	-0.93%**	0.88%**
PARKING	-0.41%	1.63%	2.18%**	-1.69%**	-0.67%	2.15%**	0.24%	1.28%*	-0.08%	1.35%**
SIGNAGE	-1.91%	-1.62%	1.81%	-2.94%**	0.62%	0.44%	-0.36%	-0.53%	0.09%	-0.66%*

Attributes: NATENVR=Condition of the natural environment; SCENERY=Scenery at this site/area; SAFETY=feeling of safety; TRAILS=Condition of forest trails; VALUE=Value for fees paid (for fee sites only); ROADS=Condition of forest roads; PARKING=Available parking; SIGNAGE=Adequacy of signage to this site.

\*Statistically significant for  $\alpha = 0.10$

\*\*Statistically significant for  $\alpha = 0.05$

Positive rate of change (significant)

Negative rate of change (significant)

attributes were in satisfaction with NATENVR for the Rocky Mountain region, alongside static importance, though this downturn was not sufficient to leave the GW quadrant.

ROADS, PARKING, and SIGNAGE are attributes that span the physical, informational, or directional aspects of visitation. These attributes fell into the LP quadrant across all regions. SIGNAGE tended to have the lowest satisfaction, while PARKING and ROADS showed the lowest levels of importance. Declining satisfaction levels coupled with static or growing importance occurred for ROADS in the Pacific Coast region and the Nation, but these changes were not yet problematic given the low means. Satisfaction levels for PARKING significantly increased with declining importance for the South.

TRAILS could be in need of work (CH) for the North and Rocky Mountain regions, along with a borderline result for the Nation. TRAILS fell into the LP quadrant for the South through round 3. If importance increases relative to satisfaction into round 4 for these regions, then attention may be needed in improving the condition of forest trails. This attribute was classified as PO for the Pacific Coast in round 3; importance and satisfaction increased for that region as well as for the Nation. Importance became significantly greater (with static satisfaction) for TRAILS for the Rocky Mountain region between rounds, which shifted the attribute to the CH quadrant.

The VALUE attribute was of low priority for the South and Pacific Coast regions and the Nation, and borderline for the North and Rocky Mountain regions. In the North, VALUE appeared on the threshold dividing the CH and LP

quadrants. This finding may warrant attention should the trend persist to round 4. Visitors to the South attached less importance to VALUE in round 3 than in round 2. In contrast, recreationists in the Rocky Mountain region perceived greater importance. Overall, however, VALUE remained higher in both importance and satisfaction for the South than for the other regions.

Because the iso-priority line uses distances as a measure of relative attention needed, the results within the interior of the CH section could require more attention than the borderline results. However, budgetary considerations permitting, the borderline attributes could warrant monitoring. The iso-priority line indicated that NATENVR and SIGNAGE may need attention across the Nation and all RPA regions, with a borderline result for the North in NATENVR, so that satisfaction at least matches the importance levels. Placement of attributes within the interior of the CH section indicated that TRAILS could need attention in the North and South, as well as VALUE in the South and ROADS in the South and Rocky Mountain regions and the Nation. Attributes appearing in the CH quadrant but near the iso-priority line indicated borderline results: SAFETY for the South, VALUE for the North and Pacific Coast regions, ROADS for the Pacific Coast, TRAILS for the Nation, and PARKING for the South (borderline). The iso-priority line had the greatest impact in reclassifying attributes for the South, which has less variation in importance than the other regions.

**Intertemporal analysis for GFA**—Satisfaction in GFA had the greatest growth in PARKING for visitors to the South, though in conjunction with declining

importance (table 3). TRAILS had the greatest growth in importance for the Rocky Mountain GFA, with unchanging satisfaction levels and a shift from LP to CH. In none of the regions or site types did satisfaction and importance simultaneously increase significantly for GFA.

Changes that may warrant concern occurred for VALUE in the North, and ROADS in the North and the Nation. The VALUE attribute in the North may be the most in need of consideration, given the shift from PO to the threshold close to the CH quadrant. NATENVR declined slightly in satisfaction for the South and Rocky Mountain regions and the Nation amid stable importance. This decrease is not yet problematic given the consistent placement of the means into the GW quadrant, but it could call for understanding why satisfaction declined between rounds. Also declining in satisfaction with stable importance were SCENERY in the South, VALUE in the Nation, and ROADS in the Pacific Coast region. VALUE in the South and SIGNAGE in the North declined in satisfaction, but did not warrant concern due to the co-occurring loss in importance. Visitors recreating in the South perceived safety and conditions of forest roads as less important amid sustained levels of satisfaction since round 2.

Following are summarized managerial implications for the RPA regions and the Nation in the GFA site type. Borderline results are indicated by regions in italics.

**Concentrate here (Relatively high importance, relatively low satisfaction)**

- Condition of forest trails (*North and Rocky Mountain*)

**Keep up the good work (Relatively high importance, relatively high satisfaction)**

- Condition of the natural environment (All)
- Scenery at this site/area (All)
- Feeling of safety (All)

**Low priority (Relatively low importance, relatively low satisfaction)**

- Adequacy of signage to site (All)
- Value for fee paid (South, *Rocky Mountain*, Pacific Coast, and Nation)
- Condition of forest trails (South and *Nation*)
- Available parking (All)
- Condition of forest roads (All)

**Possible overkill (Relatively low importance, relatively high satisfaction)**

- Condition of forest trails (Pacific Coast)

**Indeterminate due to proximity to thresholds**

- Value for fee paid (North)
- Condition of forest trails (North and Nation)

**Potential shifts to area of concern per iso-priority line (i.e., satisfaction did not equal or exceed perceived importance)**

- Condition of the natural environment (*North*, South, Rocky Mountain, Pacific Coast, and Nation)
- Adequacy of signage to site (All)
- Condition of forest trails (North and South)
- Value for fee paid (*North*, South, and *Pacific Coast*)
- Condition of forest roads (South, Rocky Mountain, *Pacific Coast*, and Nation)
- Feeling of safety (*South*)

**Day-Use Developed Sites (DUDS)**

Analyses of DUDS covered all 11 attributes. In addition to those for GFA, developed facilities (DEVFACILITIES), cleanliness of restrooms (CLEANLINESS), and condition of parking lot (PARKINGLOT) were analyzed (fig. 8). These additional attributes explain how visitors perceived elements that are relevant to developed sites but not applicable to WILD or GFA.

**Attribute classifications for DUDS**—NATENVR, SCENERY, and SAFETY all appeared in the GW quadrant for both rounds. Visitors to DUDS for all regions and the Nation perceived a safe and fulfilling experience in nature. The Pacific Coast performed well temporally, achieving gains in satisfaction on all three attributes. The perception of safety also had gains in satisfaction for all but the South. Declines in satisfaction occurred for NATENVR in the South and Rocky Mountain regions, but the attribute remained in the GW quadrant.

SIGNAGE may need improvement (CH) for all regions, with borderline results for the Rocky Mountain and Pacific Coast regions and the Nation. Visitors in the North and Nation were more satisfied with SIGNAGE in round 3, while viewing it with the same levels of importance; in the South, importance increased with unchanged satisfaction (table 4). These changes either maintained or shifted placement of the attribute into the CH interior.

Likewise, CLEANLINESS may need attention (CH) across all regions and the Nation, demonstrating the overall lowest satisfaction levels, especially in the North, Rocky Mountain, and Pacific Coast regions and the Nation. The attribute became more important to visitors in round 3 in the South and Pacific Coast, with satisfaction levels unchanged in the former and greater in the latter. The progression in both

Site Type DUDS

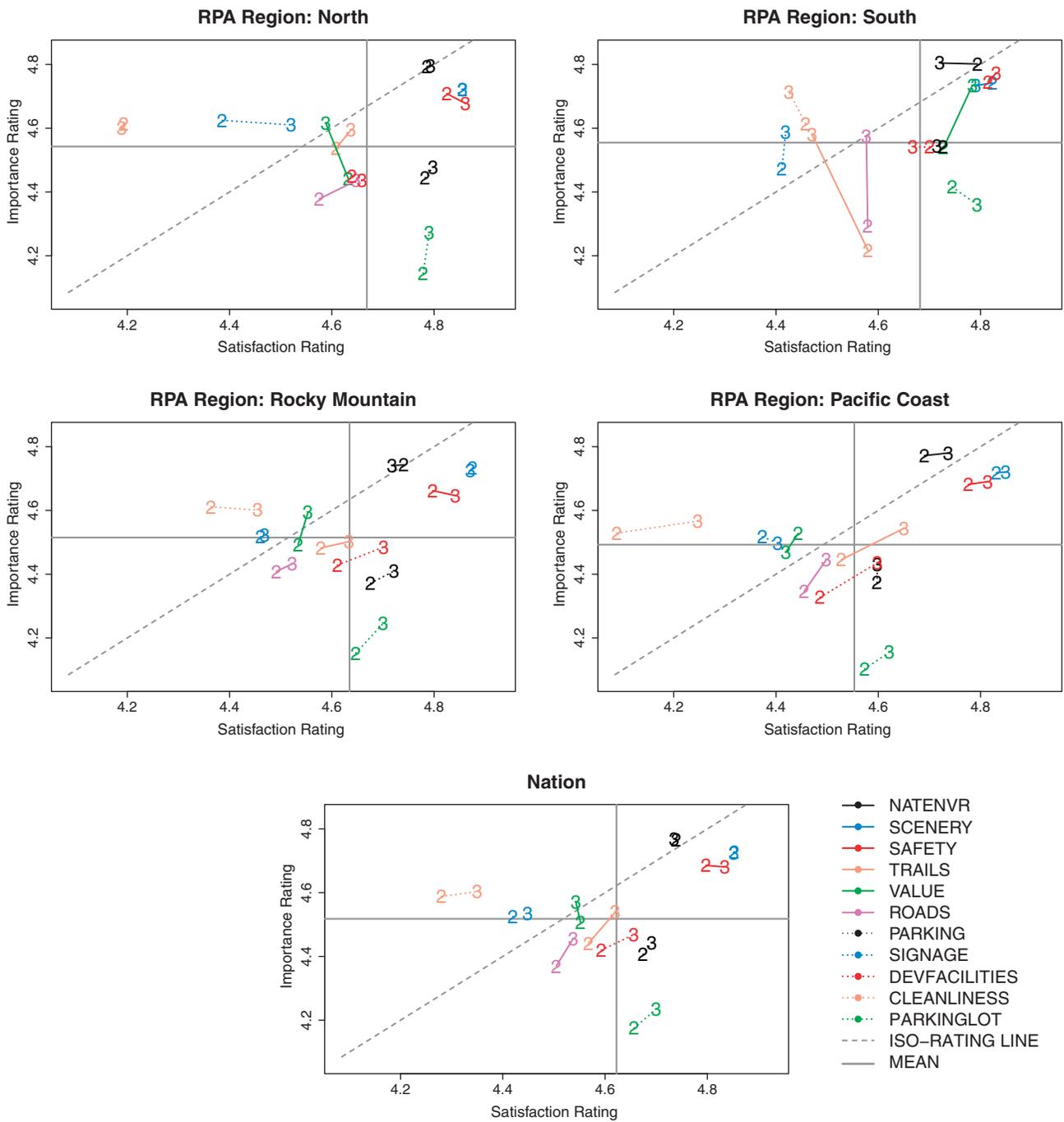


Figure 8—Importance-performance analysis for day-use developed sites (DUDS) with weighting by inverse annual number of trips on 11 attributes across the 4 RPA regions and the Nation, from round 2 to round 3, with quadrants and hybrid iso-priority line approaches.

**Table 4—Rates of change between weighted means for satisfaction (satis) and importance (import) between rounds across Resources Planning Act regions and the Nation for day-use developed sites (DUDS), with significance determined by parametric two-sample t-testing**

Attribute	DUDS									
	North		South		Rocky Mountain		Pacific Coast		Nation	
	Satis	Import	Satis	Import	Satis	Import	Satis	Import	Satis	Import
NATENVR	0.15%	0.01%	-1.54%**	0.06%	-0.48*	-0.04%	1.00%**	0.17%	-0.09%	0.07%
SCENERY	0.00%	0.00%	-0.67%	-0.18%	-0.08%	-0.17%	0.38%*	0.03%	-0.02%	-0.10%
SAFETY	0.76%**	-0.65%	0.33%	0.58%	0.92%**	-0.33%	0.79%**	0.18%	0.77%**	-0.10%
TRAILS	0.63%	1.26%*	-2.39%**	8.63%**	1.20%**	0.44%	2.71%**	2.22%**	1.14%**	2.18%**
VALUE	-0.94%	3.90%**	1.20%*	4.33%**	0.42%	2.24%**	-0.54%	-1.29%**	-0.20%	1.45%**
ROADS	1.58%**	1.30%	-0.06%	6.61%**	0.69%	0.54%	0.98%*	2.29%**	0.74%**	1.98%**
PARKING	0.32%	0.74%	-0.25%	0.05%	0.98%**	0.88%**	0.02%	1.27%**	0.37%*	0.84%**
SIGNAGE	3.08%**	-0.31%	0.17%	2.60%**	0.18%	0.13%	0.67%	-0.43%	0.65%**	0.22%
DEVFACILITIES	0.43%	-0.34%	-0.70%	-0.03%	1.96%**	1.28%**	2.49%**	2.50%**	1.38%**	1.10%**
CLEANLINESS	-0.08%	-0.30%	-0.73%	2.15%**	2.10%**	-0.22%	3.88%**	0.83%*	1.63%**	0.33%
PARKINGLOT	0.25%	3.09%**	1.03%**	-1.26%*	1.15%**	2.23%**	1.05%**	1.27%**	0.92%**	1.41%**

Attributes: NATENVR=Condition of the natural environment; SCENERY=Scenery at this site/area; SAFETY=Feeling of safety; TRAILS=Condition of forest trails; VALUE=Value for fees paid (for fee sites only); ROADS=Condition of forest roads; PARKING=Available parking; SIGNAGE=Adequacy of signage to this site; DEVFACILITIES=Condition of developed recreation facilities; CLEANLINESS=Cleanliness of restrooms; PARKINGLOT=Parking lot condition.

\*Statistically significant for  $\alpha = 0.10$

\*\*Statistically significant for  $\alpha = 0.05$

Positive rate of change (significant)

Negative rate of change (significant)

satisfaction and importance in the Pacific Coast region may indicate a positive trend in CLEANLINESS, but with the low placement of the means in round 2, the increase in satisfaction was insufficient to declassify this attribute as CH. Gains in satisfaction occurred in the Rocky Mountain and Pacific Coast regions and the Nation on static importance, but the attribute remained in the CH quadrant even to round 3 due to the low round 2 means.

Additionally, VALUE belonged to the CH quadrant for the North and Rocky Mountain regions and the Nation, while performing well (GW) in the South and just into the LP quadrant for the Pacific Coast region. This attribute had less importance for visitors in the Pacific Coast in round 3 than in round 2, while sustaining the same levels of satisfaction. Because of the proximity of the round 2 mean to the thresholds for the Pacific Coast region, the decline of importance shifted the attribute from CH to LP. All other regions and the Nation reported greater perceptions of importance in round 3; satisfaction was unchanged except for the South, where VALUE moved into the GW quadrant.

TRAILS could need improvement (CH) in the North and South; the attribute performed well (GW) in the Pacific Coast region and produced indeterminate results for the Rocky Mountain region and the Nation. Visitors to the South perceived a decline in the condition of forest trails between rounds, while rating the attribute as more important than in round 2. This problematic trend of declining satisfaction on an increasingly important attribute could signal managerial

implications, especially for the South. Recreationists in the Pacific Coast region and visitors nationally saw improvements in both satisfaction and importance for trail conditions in round 3, but the round 2 means and the magnitudes of increases meant that classifications changed for both regions. Because of the proximity to the threshold in round 2, this intertemporal shift for the Pacific Coast meant that the attribute was in the GW quadrant by the next round. The national gains were not as strong, placing the attribute near the threshold bordering the GW quadrant. Visitors to Rocky Mountain DUDS perceived greater satisfaction while importance stayed at or near round 2 levels; this gain shifted the attribute closer to the thresholds, potentially classifying it as GW or PO depending on progressions to round 4. The shift into CH for the North occurred due to the increase in importance (over unchanging satisfaction) on a mean that was close to the thresholds in round 2.

In the PO section across all areas were PARKING (with a borderline result for South) and PARKINGLOT. Visitors generally attached the lowest importance to PARKINGLOT, although they were generally highly satisfied. In the Rocky Mountain and Pacific Coast regions and the Nation, the attribute had gains not only in satisfaction but also in importance. However, the significant increases in satisfaction observed in round 3 failed to offset the low starting mean in round 2. Visitors to North DUDS attached greater importance to parking lot conditions while satisfaction remained the same. Again, the round 2 placement deep into the PO quadrant meant that a shift into another quadrant

did not occur. However, should the increases in importance continue, then the attribute may belong to the GW quadrant by round 4 or beyond. The attribute moved even deeper into the PO quadrant in the South due to declining importance and rising satisfaction.

DEVFACILITIES was classified as PO for the Rocky Mountain and Pacific Coast regions and the Nation, and as LP elsewhere. Only the Rocky Mountain and Pacific Coast regions and the Nation had significant increases in visitor satisfaction and importance for developed facilities. Coupled with the low means in round 2, these gains in the two regions and the Nation meant a progression from LP to PO. Should importance continue to improve (with increasing or static satisfaction), this attribute could perform well (GW) to round 4. Visitors to North and South DUDS did not vary significantly in their ratings from round 2 to round 3, so the proximity to the thresholds contributes to the uncertainty of the classification in the next round.

ROADS appeared as LP for all but the South, where it could need attention. The transition from LP to CH for the South stemmed from significant increases in importance on static satisfaction levels. Pacific Coast and national DUDS visitors perceived greater satisfaction and importance levels for ROADS by round 3, but the gains failed to offset the impact of round 2 means being squarely in the LP quadrant. Visitors to the North DUDS were more satisfied with conditions of the roads by round 3 without significant changes in importance. In the South, visitors saw the attribute as significantly more important, though with unchanging satisfaction levels from round 2.

Factoring in the iso-priority line meant that NATNEVR could be in need of attention (CH) for all areas, with borderline results for the North and Rocky Mountain regions and the Nation. This indicates that even in the developed areas, the quality of the surrounding natural environment is increasingly important to recreation visitors. The diagonal also indicated SIGNAGE and CLEANLINESS as needing attention (CH) for all regions and the Nation. VALUE could also need work for the Nation and all regions but the South, with borderline results for the North and Nation. The iso-priority line also affirmed that TRAILS and ROADS (borderline) in the South could merit attention as importance equaled or exceeded satisfaction.

**Intertemporal analysis for DUDS**—Overall, satisfaction increased for many attributes for DUDS in the Rocky Mountain and Pacific Coast regions and the Nation. The greatest gains in satisfaction occurred for CLEANLINESS in the Pacific Coast; while still in the CH quadrant, the attribute shifted in a positive direction closer to the GW section.

For DUDS, declines in satisfaction occurred for NATNEVR in the South (where it was most pronounced) and Rocky Mountain regions (table 4). If the satisfaction continues to decline with static or increasing importance in the South, then management may need to evaluate the loss in fulfillment from the natural environment. TRAILS in the South could also warrant attention because of declining satisfaction and increasing importance. VALUE became less important in round 3 for the Pacific Coast. This result was also observed for PARKINGLOT in the South.

Following are summarized managerial implications for the RPA regions and the Nation in the DUDS site type. Borderline results are indicated by regions in italics.

**Concentrate here (Relatively high importance, relatively low satisfaction)**

- Cleanliness of restrooms (All)
- Adequacy of signage to this site (North, South, *Rocky Mountain, Pacific Coast, and Nation*)
- Value for fees paid (North, Rocky Mountain, and Nation)
- Condition of forest roads (South)
- Condition of forest trails (North and South)

**Keep up the good work (Relatively high importance, relatively high satisfaction)**

- Condition of the natural environment (All)
- Scenery at this site/area (All)
- Feeling of safety (All)
- Value for fee paid (South)
- Condition of forest trails (Pacific Coast)

**Low priority (Relatively low importance, relatively low satisfaction)**

- Condition of forest roads (North, Rocky Mountain, Pacific Coast, and Nation)
- Condition of developed recreation facilities (*North and South*)
- Value for fee paid (*Pacific Coast*)

**Possible overkill (Relatively low importance, relatively high satisfaction)**

- Parking lot condition (All)
- Available parking (North, *South*, Rocky Mountain, Pacific Coast, and Nation)
- Condition of developed recreation facilities (Rocky Mountain, Pacific Coast, and Nation)

### Indeterminate due to proximity to thresholds

- Condition of forest trails (Rocky Mountain and Nation)

### Potential shifts to area of concern per iso-priority line (i.e., satisfaction did not equal or exceed perceived importance)

- Cleanliness of restrooms (All)
- Adequacy of signage to site (All)
- Value for fee paid (*North*, Rocky Mountain, Pacific Coast, and *Nation*)
- Condition of forest trails (*South*)
- Condition of forest roads (*South*)
- Condition of the natural environment (*North*, *South*, *Rocky Mountain*, Pacific Coast, and *Nation*)

### Overnight-Use Developed Sites

The 11 attributes assessed for DUDS were also examined for the second developed site type, OUDS. Users of this site type factored in their experience with the developed sites, although in this case “developed facilities” includes facilities related to overnight accommodations, whether by lodging, camping, or recreational vehicle (fig. 9).

**Attribute classifications for OUDS**—Performing well (GW) were the NATENVR, SCENERY, and SAFETY attributes, which are integral to a secure and satisfying recreation experience. These results were consistent with findings for the other three site types examined. Satisfaction improved with static importance for all three attributes in the Pacific Coast region, as well as for NATENVR in the North and SAFETY in the Nation (table 5), preserving the GW classification to round 3. Visitors perceived a greater importance in round 3 with unchanging satisfaction levels for NATENVR in the South and Nation and SAFETY in the South, pushing the results farther into the GW interior. Positive trends for both satisfaction and importance occurred for SCENERY for visitors in the South. Satisfaction declined for visitors between rounds 2 and 3 in the Rocky Mountain region for NATENVR and SCENERY, and NATENVR approached the threshold dividing the GW and CH quadrants. If this trend continues to round 4, the conditions contributing to declining satisfaction may warrant a closer look and possible reallocation of resources.

The quadrants approach indicated that CLEANLINESS needs improvement across all regions and the Nation, often having the lowest satisfaction means but relatively high importance scores, especially in the South and Pacific Coast regions. Nationally and in the South, visitors viewed cleanliness of restrooms with greater importance by round 3, while

maintaining satisfaction levels; the South reported the largest increase in importance. In the Pacific Coast region, visitors were more satisfied with the attribute by round 3, though importance was static. Regardless, the attribute remained in the CH quadrant due to the starting point in round 2.

SIGNAGE appeared in the CH section for the North (borderline), South and Rocky Mountain regions, and the Nation (borderline), while being low priority for the Pacific Coast. Adequacy of signage was one of the lower-rated attributes for satisfaction; the importance by region determined whether this attribute was classified as CH or LP. Visitors in round 3 found SIGNAGE more important with unchanged satisfaction in the South and Rocky Mountain regions and the Nation, resulting in a shift to the CH quadrant. Recreationists in the North viewed SIGNAGE with improved satisfaction levels alongside static importance. The shift from LP to CH for the North was largely due to the proximity to the thresholds in round 2 and the slight (but not statistically significant) increase in importance.

TRAILS could require maintenance (CH) for the South and possibly for the North, while having low priority or being overkill in other regions. The shift of greatest concern for TRAILS occurred in the South, with declining satisfaction and increasing importance to round 3. The attribute improved in both satisfaction and importance for the Rocky Mountain region and the Nation, with a classification of LP, though shifts could occur depending on the trends to round 4. Visitors to the Pacific Coast were more satisfied with trail conditions in round 3 coupled with unchanged importance, thereby yielding the PO classification for TRAILS.

VALUE fulfilled expectations (GW) for the North, South, and Pacific Coast (borderline) regions and the Nation, with attention possibly needed (CH) in the Rocky Mountain region. The visitors in the North and South in round 3 found greater satisfaction on VALUE, which likewise gained importance. Nationally, by round 3, increasing satisfaction on VALUE along with static importance shifted the means from near the threshold in CH into the interior of GW. The Pacific Coast trend for VALUE could be indeterminate given the shift from one threshold to another; though visitors were more satisfied on this attribute, they judged it as less important.

ROADS were deemed low priority for all but the South, where the attribute fell into the CH quadrant. The conditions of roads on the site became more important in round 3 for visitors in the South and Rocky Mountain regions and the Nation, while sustaining round 2 importance levels. The growth in importance for the South was sufficient to exceed the threshold for the CH quadrant.

Site Type OUDS

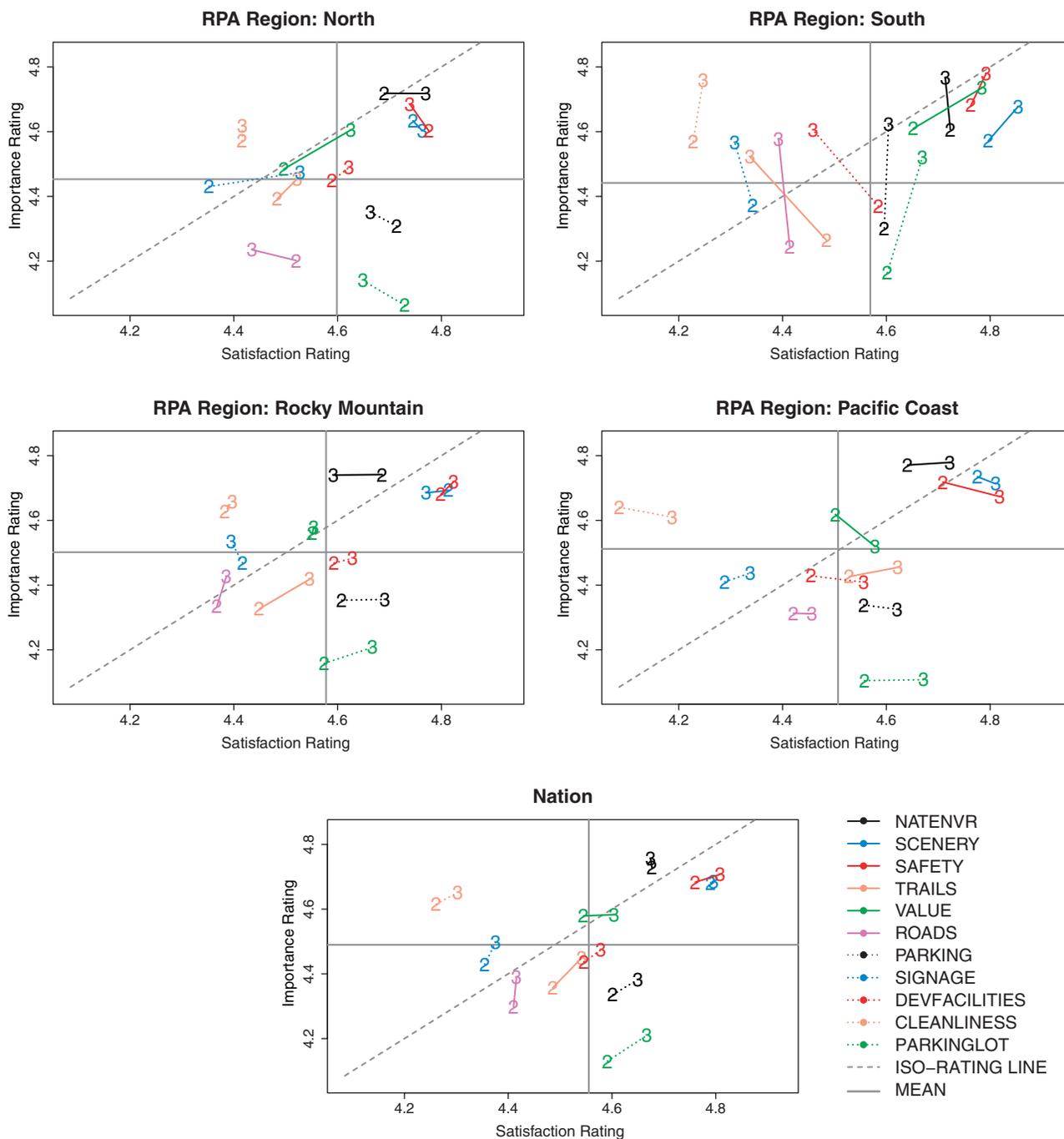


Figure 9—Importance-performance analysis for overnight-use developed sites (OUDS) with weighting by inverse annual number of trips on 11 attributes across the 4 RPA regions and the Nation, from round 2 to round 3, with quadrants and hybrid iso-priority line approaches.

**Table 5—Rates of change between weighted means for satisfaction (satis) and importance (import) between rounds across Resources Planning Act regions and the Nation for overnight-use developed sites (OUDS), with significance determined by parametric two-sample t-testing**

Attribute	OUDS									
	North		South		Rocky Mountain		Pacific Coast		Nation	
	Satis	Import	Satis	Import	Satis	Import	Satis	Import	Satis	Import
NATENVR	1.71%**	-0.01%	-0.21%	3.47%**	-2.00%**	-0.03%	1.76%**	0.17%	-0.06%	0.58%**
SCENERY	0.37%	-0.66%	1.20%**	2.33%**	-0.90%**	-0.17%	0.74%*	-0.46%	0.12%	0.10%
SAFETY	-0.77%	1.81%	0.61%	2.10%**	0.51%	0.82%	2.33%**	-0.95%	1.00%**	0.51%
TRAILS	0.86%	1.40%	-3.29%**	6.06%**	2.18%**	2.12%**	2.06%**	0.64%	1.25%**	2.13%**
VALUE	2.88%*	2.70%**	2.84%**	2.71%**	0.06%	0.38%	1.69%**	-2.14%**	1.30%**	0.08%
ROADS	-1.89%	0.80%	-0.49%	7.83%**	0.41%	2.11%**	0.81%	-0.04%	0.13%	2.11%**
PARKING	-1.08%	1.00%	0.18%	7.44%**	1.80%**	0.05%	1.42%**	-0.30%	1.05%**	1.09%**
SIGNAGE	4.03%**	0.99%	-0.81%	4.41%**	-0.50%	1.48%**	1.14%	0.63%	0.49%	1.53%**
DEVFACILITIES	0.71%	0.91%	-2.74%**	5.40%**	0.78%	0.32%	2.28%**	-0.45%	0.72%*	0.82%*
CLEANLINESS	0.01%	1.02%	0.46%	4.14%**	0.33%	0.70%	2.50%**	-0.65%	0.97%	0.78%**
PARKINGLOT	-1.71%*	1.88%	1.47%*	8.56%**	2.03%**	1.20%	2.49%**	0.07%	1.65%**	1.93%**

Attributes: NATENVR=Condition of the natural environment; SCENERY=Scenery at this site/area; SAFETY=Feeling of safety; TRAILS=Condition of forest trails; VALUE=Value for fees paid (for fee sites only); ROADS=Condition of forest roads; PARKING=Available parking; SIGNAGE=Adequacy of signage to this site; DEVFACILITIES=Condition of developed recreation facilities; CLEANLINESS=Cleanliness of restrooms; PARKINGLOT=Parking lot condition.

\*Statistically significant for  $\alpha = 0.10$   
 \*\*Statistically significant for  $\alpha = 0.05$

Positive rate of change (significant)  
 Negative rate of change (significant)

PARKINGLOT and PARKING could be possible overkill for the Nation and all regions except the South, where they were performing relatively well (GW). PARKINGLOT, followed by PARKING, tended to be the attributes (relatively) lowest in importance. Nevertheless, both attributes gained substantially in importance, with satisfaction increasing for PARKINGLOT and remaining stable for PARKING in the South. These changes propelled the attributes into the GW quadrant from the round 2 PO results. For both parking-related attributes, the Rocky Mountain and Pacific Coast regional visitors were more satisfied in round 3 than in round 2, though with importance at round 2 levels. Visitors nationally were more satisfied with both attributes and viewed them as more important than in the previous round. Because the round 2 means were squarely in the PO quadrant, the gains for both attributes in satisfaction and importance were not sufficient for the GW quadrant. Satisfaction declined for PARKINGLOT in the North, where visitors perceived importance at round 2 values, so the attribute remained in the PO section.

DEVFACILITIES performed well (GW) in the North, with attention needed (CH) in the South by round 3 and possible overkill for the Rocky Mountain and Pacific Coast regions and the Nation. The national mean for DEVFACILITIES tended toward the threshold bordering GW, so this may signal a change if the trend persists to round 4. Visitors' perceptions

of developed facilities in the South showed significantly declining satisfaction on increasing importance, driving the attribute to the CH classification. In the Pacific Coast region and the Nation, visitors' satisfaction levels increased, with static importance in the former and increasing importance in the latter. Though the changes in DEVFACILITIES for the North were not intertemporally significant, the proximity to the threshold and slight changes motivated a marginal shift to the GW quadrant.

The iso-priority line confirmed CLEANLINESS as needing attention in the Nation and all regions. SIGNAGE could warrant attention in the South, Rocky Mountain, and Pacific Coast regions and the Nation. VALUE needed work in round 2 for the Pacific Coast and the Nation, but satisfaction rose by round 3. However, this attribute could be in need of attention for the Rocky Mountain region. In the South, SAFETY and PARKING tended toward the diagonal, so this could signal potential changes toward the CH section depending on future patterns. In the South, attributes in the CH quadrant had a relatively large increase in importance relative to the changes in satisfaction (generally declining) to round 3. The iso-priority line confirms these attributes as potentially problematic: DEVFACILITIES, ROADS, and TRAILS, along with the aforementioned SIGNAGE and CLEANLINESS.

**Intertemporal analysis for OUDS**—OUDS visitors generally maintained or gained satisfaction across attributes between rounds, with few exceptions (table 5). Adequacy of signage in the North showed the greatest gain in satisfaction, though at static importance levels. The importance of PARKINGLOT increased in the South by almost 8.6 percent between rounds, the largest jump in any measure for OUDS. Parking lot conditions become especially important to those using overnight facilities, as reflected in this gain, and users found the experience increasingly satisfactory in that respect. A general pattern of increased importance with relatively static satisfaction across many attributes was reported for OUDS in the South.

Satisfaction declined while importance remained unchanged for NATENVR and SCENERY in the Rocky Mountain region, as did PARKINGLOT in the North. The potentially problematic trend of increasing importance and a downturn in satisfaction was observed for TRAILS and DEVFACILITIES for the South. These shifts into the CH quadrant can be seen in figure 9. TRAILS displayed the greatest loss in satisfaction between rounds, along with a relatively large increase in importance.

Following are summarized managerial implications for the RPA regions and the Nation in the OUDS site type. Borderline results are indicated by regions in italics.

**Concentrate here (Relatively high importance, relatively low satisfaction)**

- Cleanliness of restrooms (All)
- Adequacy of signage to site (North, South, Rocky Mountain, and *Nation*)
- Condition of forest trails (South)
- Condition of forest roads (South)
- Condition of developed recreation facilities (South)
- Value for fee paid (Rocky Mountain)

**Keep up the good work (Relatively high importance, relatively high satisfaction)**

- Condition of the natural environment (All)
- Scenery at this site/area (All)
- Feeling of safety (All)
- Value for fee paid (North, South, *Pacific Coast*, and *Nation*)
- Condition of developed recreation facilities (North)
- Available parking (South)
- Parking lot condition (South)

**Low priority (Relatively low importance, relatively low satisfaction)**

- Condition of forest roads (North, Rocky Mountain, Pacific Coast, and *Nation*)
- Condition of forest trails (Rocky Mountain and *Nation*)
- Adequacy of signage to this site (*Pacific Coast*)

**Possible overkill (Relatively low importance, relatively high satisfaction)**

- Available parking (North, Rocky Mountain, Pacific Coast, and *Nation*)
- Parking lot condition (North, Rocky Mountain, Pacific Coast, and *Nation*)
- Condition of developed recreation facilities (Rocky Mountain, Pacific Coast, and *Nation*)
- Condition of forest trails (*Pacific Coast*)

**Indeterminate due to proximity to thresholds**

- Condition of forest trails (North)

**Potential shifts to area of concern per iso-priority line (i.e., satisfaction did not equal or exceed perceived importance)**

- Cleanliness of restrooms (All)
- Condition of forest trails (South)
- Condition of forest roads (South and Rocky Mountain)
- Adequacy of signage to site/area (South, Rocky Mountain, Pacific Coast, and *Nation*)
- Condition of developed recreation facilities (South)
- Available parking (South)
- Condition of the natural environment (South, Rocky Mountain, Pacific Coast, and *Nation*)
- Value for fee paid (*Rocky Mountain*)

**Overall Satisfaction**

The NVUM satisfaction module contains two additional measures by which visitors may rank their overall satisfaction and perceptions of crowding during their exit interview. The overall satisfaction pertaining to their visit is ranked on a 5-point Likert scale, ranging across 1 (very dissatisfied), 2 (somewhat dissatisfied), 3 (neither satisfied nor dissatisfied), 4 (somewhat satisfied), or 5 (very satisfied). No significant declines in overall satisfaction occurred in responses by site type and region (table 6) from round 2 to round 3, implying that recreationists were either sustaining or improving their satisfaction levels. The greatest growth in overall satisfaction occurred for North WILD and South OUDS, both being approximately 1.5 percent, a slight but statistically significant

**Table 6—Results of t-testing on overall satisfaction and crowding ratings between rounds 2 and 3, with weighting for each Resources Planning Act region and the Nation**

Region, Site type	Overall satisfaction, round 2	Overall satisfaction, % change to round 3	Crowding, round 2	Crowding, % change to round 3
N, DUDS	4.80	0.17%	4.18	5.81%**
N, GFA	4.69	0.09%	4.21	3.99%*
N, OUDS	4.75	0.04%	4.54	9.44%**
N, WILD	4.76	1.48%**	4.12	2.60%
S, DUDS	4.76	0.55%**	4.78	-4.64%**
S, GFA	4.76	0.86%**	4.65	1.67%
S, OUDS	4.69	1.46%**	5.13	1.00%
S, WILD	4.78	0.38%	4.48	-6.98%
RM, DUDS	4.78	0.69%**	4.46	2.99%**
RM, GFA	4.73	0.25%	4.40	5.84%**
RM, OUDS	4.73	0.70%**	4.98	-0.30%
RM, WILD	4.85	0.00%	4.57	4.74%**
PC, DUDS	4.77	0.67%**	4.38	5.84%**
PC, GFA	4.72	0.76%**	4.35	6.79%**
PC, OUDS	4.72	0.62%**	4.93	2.54%
PC, WILD	4.80	0.51%**	4.25	10.60%**
Nation, DUDS	4.78	0.58%**	4.45	2.96%**
Nation, GFA	4.73	0.50%**	4.39	5.38%**
Nation, OUDS	4.72	0.71%**	4.93	1.92%*
Nation, WILD	4.81	0.34%**	4.41	4.61%**

Regions: N=North; S=South; RM=Rocky Mountain; PC=Pacific Coast.

Site types: DUDS=day-use developed sites; GFA=general forest areas; OUDS=overnight-use developed sites; WILD=designated Wilderness.

\*Statistically significant for  $\alpha = 0.10$

\*\*Statistically significant for  $\alpha = 0.05$

Positive rate of change (significant)

Negative rate of change (significant)

change given the relatively low variability. Figure 10 shows the slightly greater proportion of responses for “very satisfied” by North WILD visitors in round 3.

The 5-point scale does not provide as much spread as a 7-point scale, and the ratings are clustered at 4 and 5 for overall satisfaction, a tendency also observed in individual satisfaction measures from the 11 attributes. The low variations may be attributed to this clustering; though the gains in satisfaction were not large, they were statistically significant with respect to the variance. As a whole, none of the means for satisfaction was below 4.6 on a 5-point scale, indicating high performance overall.

## Crowding

Another aspect of sustaining satisfaction levels over the long term is monitoring increases in crowding level, which could translate to reduced recreation resources available per participant. The density of users on a site at a given time can vary by the popularity of the activities as well as visitor expectations, and thus visitor attitudes toward crowding can vary by site type. Crowding, often called perceived crowding,

is an assessment made by visitors, based on how many others they encountered during their visit (Vaske and Shelby 2008). In the NVUM survey satisfaction module, respondents were asked about their perception of crowding on their just-concluded site visit. The crowding scale ranged from 1 (hardly anyone) to 10 (overcrowded).

Crowding does not follow a linear pattern for all activities. Activities that thrive on group or social engagement may benefit from some crowding. Additionally, it may not be practical to allocate resources and personnel to staff sites with very low levels of use, such as a GFA that has little traffic during a particular time of year. Activities that depend on solitude, such as backpacking in designated Wilderness, will have a lower threshold of overcrowding, at which point the quality of the recreation experience is eroded by the presence of others. There is no one-size-fits-all approach in managing crowding, as variations occur by activity and site type, but planners can use overall satisfaction and crowding scores as indicators of areas for improvement or maintenance, and as indicators that the quality of recreation experience is, or is not, being sustained.

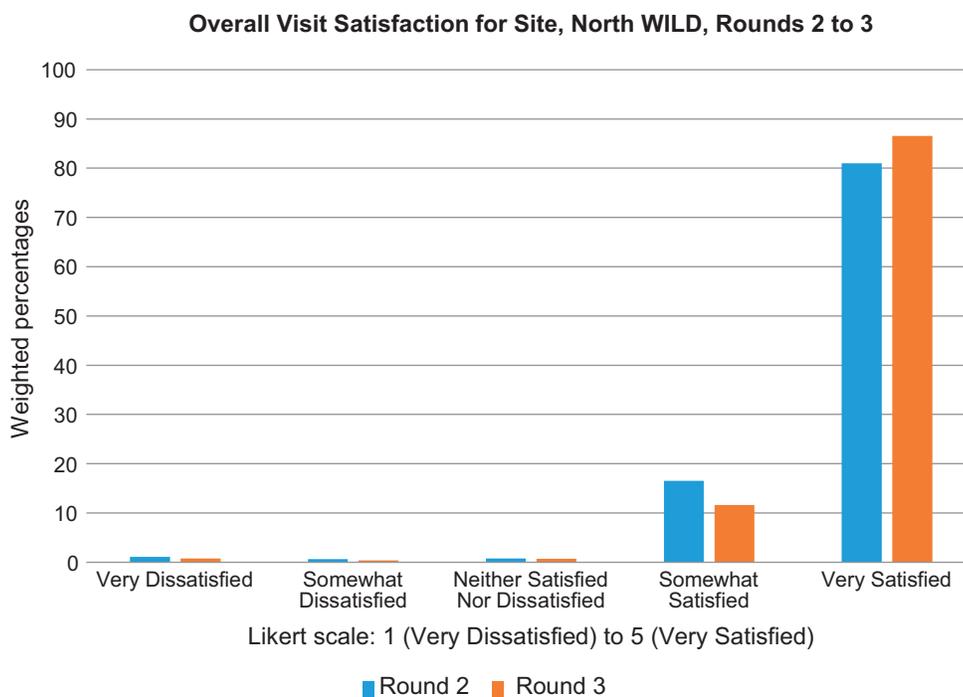


Figure 10—Distribution of National Visitor Use Monitoring responses (percentages based on weighting with inverse annual number of trips) for overall satisfaction on North designated Wilderness (WILD) for rounds 2 and 3.

From round 2 to round 3, the means across regions and site types for crowding tended to range between 4 and just over 5. Statistically significant declines in crowding ratings occurred only for South DUDS and South WILD. These downturns in crowding ratings coincided with declining satisfaction in natural elements and trails; South DUDS and South WILD experienced declining satisfaction in SCENERY and TRAILS, and visitors to South DUDS further reported decreased satisfaction in NATENVR. No significant changes in crowding could be detected for the North WILD, South GFA, and OUDS for the South, Rocky Mountain, and Pacific Coast regions. In all other site types and regions, statistically significant crowding increases were reported between rounds 2 and 3.

In the Rocky Mountain and Pacific Coast regions and the Nation, nearly all site types had crowding increases. The increase was especially pronounced in the Pacific Coast WILD at 10.60 percent between rounds (table 6). This result is generally indicative of the upward trend in national forest visitation during this time. Figure 11 reveals a bimodal distribution of responses about crowding in the Pacific Coast WILD: one for the low-level crowding centered at 2 and another for higher crowding levels at 6. Few perceived overcrowding at levels of 7 and above. Such a pattern may reflect the fact that visits to designated Wilderness often involve day visitors who do not venture deep into the backcountry and multiday visitors who more often get to more-remote locations. A contributing factor to the

temporal changes was the decrease in ratings of 1 and the increase in scores of 6, which could be problematic for WILD. Wilderness managers in the Pacific Coast and Rocky Mountain regions, and the Nation should be cognizant of the potential issues associated with two distinctly different types of users, particularly given the statutory requirements of designated Wilderness.

## CONCLUSIONS

The methods described here build on the basic technique of IPA developed by Martilla and James (1977), a procedure that has endured due to its ease of application and interpretation. IPA has been used in multiple publications over the last three decades: O’Leary and Adams (1982), Crompton and Duray (1985), Ziegler and others (2012), Albayrak (2015), and Lee (2015). Sörensson and von Friedrichs (2013) applied IPA to evaluate sustainable tourism for two groups (international and national tourists). They compared the managerial actions across the two groups, but their analysis did not include a temporal dimension. The NVUM sampling data that we analyzed introduced additional complexities and richness not recognized in Martilla and James (1977). Not only were the data collected over multiple spatial levels, the rounds entailed a temporal aspect that provided a framework for trend evaluations. The intertemporal comparisons were achieved through parametric two-sample *t*-testing, as described in Leeworthy and others (2004); they used this

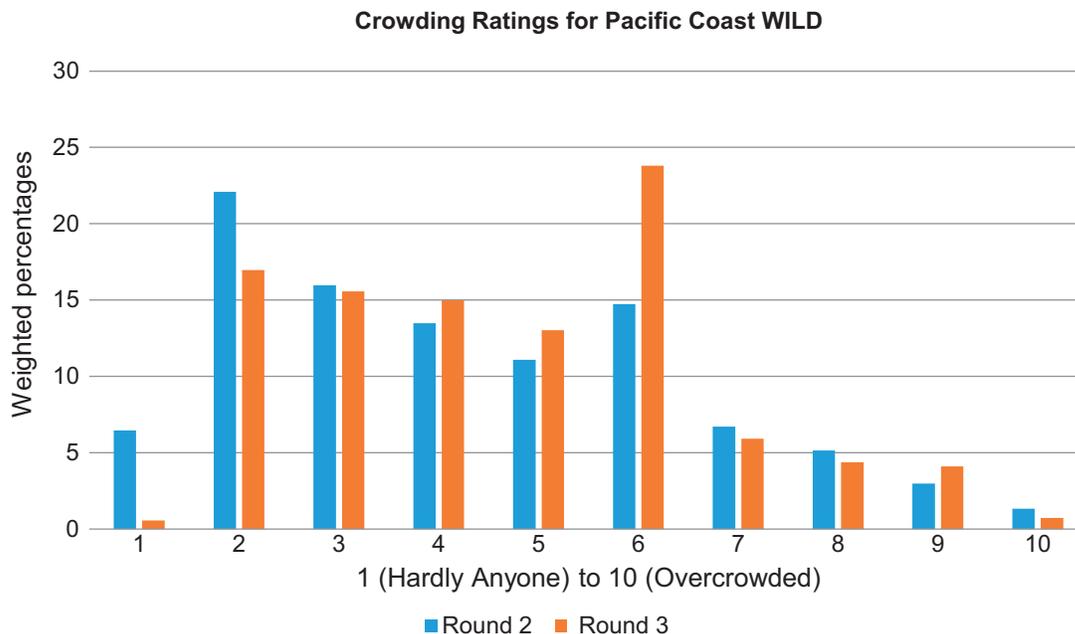


Figure 11—Distribution of National Visitor Use Monitoring responses (percentages based on weighting with inverse annual number of trips) for crowding on Pacific Coast designated Wilderness (WILD) for rounds 2 and 3.

method to compare importance and satisfaction for visitors and residents across two time periods. A further complication in our analysis was avidity bias from frequent users' increased likelihood of being sampled. Similar to Gill and others (2010), this work incorporated a weighting scheme based on the inverse of the annual number of trips to address endogenous stratification. We also added the iso-priority line methodology as discussed in Abalo and others (2007), Ziegler and others (2012), Azzopardi and Nash (2013), Lai and Hitchcock (2015), and Lee (2015). This approach has been used in a variety of settings, such as whale shark tourism in Mexico (Ziegler and others 2012). Our research presents the first applications of IPA with intertemporal testing since Leeworthy and others (2004). These results are also the first applications of this methodology to national forests.

We presented the results from the traditional IPA threshold framework first, with a secondary discussion on the attributes affected by adding the diagonal line. The diagonal line has the advantage of being data-independent, as the sole restriction is that satisfaction ratings at least match the attached importance. For example, if a respondent attaches a neutral importance rating to an attribute, then the outcome should be neutral or concurrent with at least some level of satisfaction. Attributes can therefore fall into the "good work" (GW) quadrant of conventional IPA and be in need of improvement if falling above the diagonal. Per the more stringent criterion for the iso-priority line, a user who rates an attribute as

highly important should be highly satisfied, not simply somewhat satisfied (even if the attribute is in the conventional GW quadrant). Additionally, the farther into the space above the diagonal line, the greater the mismatch is between expectations and outcomes. This may be useful in prioritizing areas of need, as the distance metric is meaningful.

Evaluating participants from a consumer standpoint can provide additional insight into the long-term outlook for outdoor recreation. The 2010 RPA Assessment and related works gauged recreation in terms of participation rates, total participants, participant intensity, and total days of activity for multiple activities (Bowker and Askew 2012, 2013; Bowker and others 1999, 2012, and 2013; Cordell 2012; Cordell and others 2013). These projections would be most helpful in managing resources and access, specifically concerning those activities that could have the most growth or decline. Looking at individuals and their decisionmaking mechanisms can provide additional insight for management. IPA results for visitors' responses about specific attributes can guide managers as they develop focused directives for improvement or maintenance and reallocate resources accordingly. With cooperative resource and attribute management, the goal outcome of an enduring satisfied user base can provide a long-term healthy outlook for outdoor recreation. Monitoring changes temporally and spatially can identify areas of need in time for improvement. For example, in a future where swimming could become increasingly popular (as indicated

by participation rates and total participants at the national level in the 2010 RPA Assessment), resources may be needed to provide more access or mitigate crowding in order to sustain the quality of users' experiences. Perhaps a waterside should be prioritized for preservation or cleanup, or beach access should be designated in response to crowding. IPA could then be used in a future study to focus on those who used the national forest for swimming activities. As an example, if users do not find parking to be convenient, then they may visit another site with more suitable parking or embark on another activity. The application of IPA means that the user base can be specified or broadened to the appropriate context.

In addition to presenting an updated IPA methodology, the major takeaway from this study is that at the regional level, all measured national forest recreation attributes have performed well (i.e., mean attribute ratings above 4) on both satisfaction and importance, meaning that recreationists were generally satisfied with factors deemed important to their recreation visits. However, because of budgetary and resource limitations affecting long-term management, there is a need to identify areas of improvement and those of "possible overkill" or "low priority." The static and temporal IPA analyses are one way to give managers insight into when resources may be shifted from the relatively less important attributes toward maintaining others to "keep up the good work" or improving those in the "concentrate here" area. Even when all attribute means are 4 or greater across the various site types and regions, identifying relative differences can inform management.

Generally, NATENVR, SCENERY, and SAFETY performed best relative to the other attributes, and were strong points in the national forest recreation experience. Though humans may not always be able to manage the conditions of the natural environment (i.e., drought, fire, disease) directly, understanding what has caused a downturn in satisfaction may help with strategic improvements. Depending on the cause, counteractive steps may be taken to mitigate decline in satisfaction for natural environment conditions. For example, in wildlife viewing, if a species has declined due to habitat loss, then preserving remaining habitats for the species may encourage a return of both the species and the viewers. Overall, the surveys revealed that people tended to seek recreation where the natural environment is enjoyable, with high quality scenery and a feeling of safety. The perception of safety became less important with the WILD stratum, as expected, where people are accustomed to, and in fact seek out, a sense of solitude and attached emphasis on NATENVR and SCENERY. In fact, none of the attributes could be considered in need of work for the WILD stratum, with the exception of the borderline TRAILS in the Pacific Coast.

For the developed site types only, the cleanliness of restrooms could warrant improvement, as the importance ratings consistently outstripped the satisfaction levels. The adequacy of signage also could benefit from improvement for DUDS and OUDS, nationally and for all regions but the Pacific Coast. Generally, the availability of parking, developed facilities, and parking lot conditions were in the "possible overkill" or "low priority" quadrant. However, OUDS developed facilities in the South fell into the "concentrate here" quadrant, while parking and parking lot conditions were in the "keep up the good work" quadrant. Developed facilities for OUDs in the North were also in the "keep up the good work" quadrant.

Regionally, the South overall tended to demonstrate more attributes above the iso-priority line, indicating potential need for attention under the more stringent criterion. The patterns of attributes for the other three regions and the Nation were mostly similar, with a few minor individual variations. The results were unique for the South under OUDS, where satisfaction changed little in conjunction with a rise in importance. Future work could be undertaken to identify the driver(s) of this growth in importance for South OUDS, by using modeling approaches on relevant explanatory variables. Increasing population growth in the South may be leading to a class of visitors different from the past. In some cases such as Rocky Mountain GFA, there were miniscule changes between rounds 2 and 3. Much larger changes occurred elsewhere, particularly in the South.

Short-term planning with long-term satisfaction in mind should acknowledge the room for improvement, as indicated by this multifaceted analysis. Though all the means are dominated by a large group of highly satisfied users with highly important items, some users were not satisfied, rating their experiences at 1 or 2. Finding out more about these users would be a potential direction for future research. Their dissatisfaction may derive from a particular setting at a specific national forest. Due to the prevalence of ratings of 4 or 5, examining the unfulfilled users more closely could perhaps reveal some patterns or systematic need for improvement. A potential next step could be to investigate what these low-rated responses have in common, if anything, but perhaps some users of a resource or experience will never be satisfied. That a substantial proportion of satisfied users appeared in the survey data indicates the health of recreation regionally and nationally. IPA provides a scientific instrument that identifies the relative weak points, and therefore indicates where resources could be allocated or shifted toward higher priorities. The simplicity of IPA's graphical story offers a way to examine 175 different mean pairs simultaneously within a site type for five geographic entities. The incorporation of a temporal aspect into IPA adds another dimension to

the analysis, with two time points currently in place as two complete rounds of NVUM sampling. As more rounds are added, the trends may be expanded and subsequently analyzed by using appropriate statistical methods. For this work, the two points represented a snapshot of recreation spanning the two rounds. This snapshot revealed multiple avenues of insight into visitors with respect to satisfaction and thereby provided managers with an opportunity to assess potential trends. This graphical presentation of the temporal aspect is also novel, incorporating the trend lines and contributing to an assessment of sustainability.

With the application of parametric *t*-testing, we compared the mean scores from round 2 to round 3 for satisfaction and importance ratings. The application of a parametric test and quantification of the Likert-type items have been done in practice across many studies, and in some cases, the parametric test may perform well, depending on the setting (i.e., scope of the Likert scale, sample sizes). Relatively speaking, many of the attributes did not change significantly temporally, perhaps because of the prevalence of high ratings. These left-skewed distributions most likely dominated the mean computations, creating less variability than with a 7-point or higher interval scale. The distributions were thus similar enough for little change to occur between rounds. However, some of the attributes did significantly decline or increase. A decline in satisfaction with an increase in importance or a large decline in satisfaction with static importance is a pattern of concern. The parametric testing was also applied to the overall satisfaction and crowding ratings, revealing overall high levels of satisfaction with increases to round 3. With few exceptions, crowding generally increased to round 3, indicating growth in encounters of other recreationists on trips consistent with the trend of increased visitation across all national forest setting types. As crowding has ultimately been shown to have a negative effect on visitor satisfaction, it may be only a matter of time before satisfaction ratings for crowding begin to fall. This outcome could be averted through carefully considered limits to carrying capacity, where applicable, or increasing infrastructure to accommodate the increased demand. The interactions between satisfaction and crowding in the future will be of interest, and are likely to cause concern about management of supply and demand for managers facing limited resources.

### Limitations and Future Directions

**Sampling**—An inherent challenge is quantifying importance and performance, as there are multiple perspectives and ways of gleaned responses. Direct and indirect measures of importance each have their own set of issues. An alternative formulation that may address the problems of both methods is that of partial ranking (Abalo

and others 2007, Azzopardi and Nash 2013). The rater is asked to evaluate the set of attributes all at once, ranking in order the importance of each with no ties permitted. This has the advantage of removing the redundancy of using the same scale not only for performance but also for importance; the rater must be more engaged in evaluation to express his or her decisionmaking mindset accurately. The importance scores are necessarily dispersed, as respondents cannot rate attributes using the same range (Abalo and others 2007). Additionally, another potential improvement could be expanding the existing 5-point scale to 7 points for greater spread of responses but at the cost of the ability to compare results with rounds 2 and 3.

Users of IPA may encounter the “ceiling effects” problem, where importance ratings are scored highly, or inflated, for most attributes (Lai and Hitchcock 2015). One underlying reason is that the attributes have been prescreened to be important in determining consumer satisfaction, which can be affirmed by high mean importance ratings. Another potential source of bias is rater fatigue or common method bias (Podsakoff and others 2003). Raters may provide inaccurate answers if the survey is deemed arduous because the questionnaire is too long or intrusive. Additionally, if the sets of importance and satisfaction questions are presented simultaneously, then raters may find the task repetitive, and responses to the two scales may be dependent. A design strategy is to eliminate the confounding caused by simultaneous presentation by asking for ratings of all attributes on one aspect (importance or performance) before the other. This separation of evaluations by importance and satisfaction encourages raters to contemplate the entire set of attributes in one sense before moving to the next (Podsakoff and others 2003). A type of common method bias known as social desirability occurs when respondents provide answers that are socially acceptable or agreeable rather than honest (Podsakoff and others 2003). This is a realization of the Hawthorne effect, where subjects exhibit different behavior than if unaware of being observed (Lai and Hitchcock 2015, Schwartz and others 2013). NVUM surveys are administered with a trained interviewer; though the responses are kept anonymous, there is a face-to-face interaction between interviewer and respondents. Another type of bias seen with survey data is that of common scale formats, where covariation occurs because of the same scale being used for rating of multiple items (Podsakoff and others 2003).

**Analysis**—Like most analytical approaches, IPA has some shortcomings, but it is extensively used in multiple applications due to its simplicity and applicability. The analysis starts with a simplification of complex human reasoning and the challenges of surveys, but the output is conveniently interpreted, acknowledging the inherent

limitations. The analyses of Likert-type items present challenges in representing an ordinal variable as numeric, with an underlying continuous distribution. An approach to consider is satisfying the normality assumption of *t*-testing by using summated scales of at least five attributes (Clason and Dormody 1994). Because we proceeded with analysis on Likert-type items, we must consider whether temporal comparisons are based on parametric or nonparametric methods. In this paper, we computed *t*-tests on means between rounds 2 and 3. Using a *t*-test assumes a continuous variable and is powerful under the assumptions of normality and population homoscedasticity. Though generally more powerful than nonparametric tests, parametric testing may not retain validity under significant departures from the underlying assumptions. Therefore, a nonparametric method such as the Mann-Whitney-Wilcoxon test may be more suitable (Clason and Dormody 1994, de Winter and Dodou 2010). On a 5-point Likert scale, de Winter and Dodou (2010) found through simulation that power is generally equivalent for *t*-testing and Mann-Whitney-Wilcoxon testing. This approach does not necessarily guarantee similar properties on a 7-point scale, as the wider range can lead to greater skewness. The Mann-Whitney-Wilcoxon test can be preferable in some cases, with *t*-testing used in others. Overall, the methodology can be selected on a case-by-case basis, depending on the underlying distribution and number of points on the Likert scale. A future methodological extension would be to compare the results under Mann-Whitney-Wilcoxon methods and the *t*-testing in this study. This work used the parametric approach described by Leeworthy and others (2004).

An underlying element of complexity to NVUM data analysis is the stratification of sampling, namely on multiple-use levels within site types (e.g., low-, medium-, and high-use DUDS). Use levels at a given site type may vary temporally, depending on the day of week, season, conditions, and popularity shown in LER traffic. The NVUM sampling protocol acknowledges budgetary limitations in the sampling design by factoring in use levels. Fewer sampling days may be allocated to a high-use site type than a low-use one due to the higher traffic expected in a shorter timeframe. Within each sampling day, per NVUM methodology, a 24-hour count of exiting traffic is computed, along with 6 hours of onsite exit interviews. In the current weighting scheme, the only adjustments made were based on the reported trips taken by a visitor annually. By not stratifying further, the current analysis looked at the site type level only, ignoring the additional information of use level and acknowledging a known source of variation. It may be more efficient to assure high quality of experiences at sites with high use levels within a site type. This approach could present some analytical issues in computation of standard errors, biasing

them downward. However, already inherent in basic IPA is the technical matter that assumes an underlying continuous distribution for a set of qualities treated as integers. This analysis was intended to establish a foundation in application of IPA to NVUM data to examine short- and long-term recreation sustainability. Now that a simple application has been established, future work can address the complexity of site type use levels, factoring in an additional layer of known variation due to stratification. The statistical software SAS® (SAS Institute Inc., Cary, NC) includes powerful tools that may supplement future work, such as PROC SURVEYSELECT, which factors in intricate probability-based sampling designs (An and Watts 1998).

There are elements in the IPA methodology that may be improved, but efforts to improve them can bring about another set of issues or detract from the appeal of the original version. Likewise, any analyses using Likert-type items also have the underlying issue of scale, but analyses are computed with this understanding and acknowledgment. Further research should investigate these more complex analyses and compare them against the results of basic IPA. Research continues into IPA, with more complex formulations being discovered while the basic methodology remains popular. Now that we have a simple representation for the sampling scheme in place, the next level of research will be to factor in the complex sampling design over use levels. It will be of interest to compare results computed from subsequent IPA designs against this simpler foundational application.

An important component of management strategy is to monitor recreationists' satisfaction over time, as users can indicate through the NVUM survey process those areas performing highly and those in need of remediation. With the NVUM Program's network of sampling, this work presents a systematic and convenient use of those responses toward better understanding visitor satisfaction. The methodology for this report presented both a fundamental IPA and a hybrid approach using the thresholds of basic IPA and a diagonal line for increased sensitivity, combined with an intertemporal framework that can be extended to future time points. Additionally, understanding overall satisfaction levels and crowding perception in time may be valuable supplements. Overall satisfaction can be an indicator of how fulfilling each recreationist finds the overall experience, rather than rating by attribute. Levels of crowding can serve as a gauge of users' space perceptions, and suitable levels may vary by site type. An acceptable level of crowding for developed sites will not match that for designated Wilderness. Therefore, by monitoring crowding and general satisfaction perceptions over time in conjunction with IPA, we have established a multifaceted perspective on the recreation visitor base.

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The outdoor recreation component of the 2010 Resources Planning Act (RPA) Assessment provided projections and modeling of participation and intensity by activity. Results provided insight into the future of multiple outdoor recreation activities through projections of participation rates, number of participants, days per participant, and total activity days. These projections can be considered in managing potential shifts in outdoor recreation. In anticipation of projected trends, resources can be allocated appropriately by each outdoor recreation activity, or by the settings in which these activities take place. Decades of marketing and consumer research have established that an industry depends on and benefits from satisfied customers. In this study, we apply a widely used tool with origins in marketing research known as importance-performance analysis (IPA) to better understand visitor satisfaction with recreation settings on national forests. The results from IPA can supplement planning for improving efficient provision of recreation opportunities through management of setting attributes, which in turn could reinforce activity popularity and intensity. With the systematic and consistent data collection methodology in place from the National Visitor Use Monitoring Program, we assessed visitor ratings of importance and satisfaction on multiple attributes related to national forest recreation, as well as overall satisfaction and crowding ratings, over two recent survey periods (rounds 2 and 3) spanning 10 years. These attributes ranged from those in the natural domain (e.g., condition of natural environment and quality of scenery) to the developed setting (e.g., availability of parking and condition of parking lots). We classified the attributes into one of four IPA management actions and also conducted an intertemporal analysis to assess sustainability. The significance of changes in importance and satisfaction between rounds can provide insight into potentially problematic shifts, such as declining satisfaction in conjunction with increasing importance. Overall, users of the national forests were satisfied and found the attributes important. We identify relative overperformers and underperformers to better inform the allocation of resources within site type per attribute for the RPA regions and the Nation.

**Keywords:** Importance-performance analysis, National Visitor Use Monitoring (NVUM) Program, outdoor recreation, recreation setting attributes, Resources Planning Act (RPA) Assessment, visitor satisfaction.



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